INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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The Shop Teachers' Professional Magazine

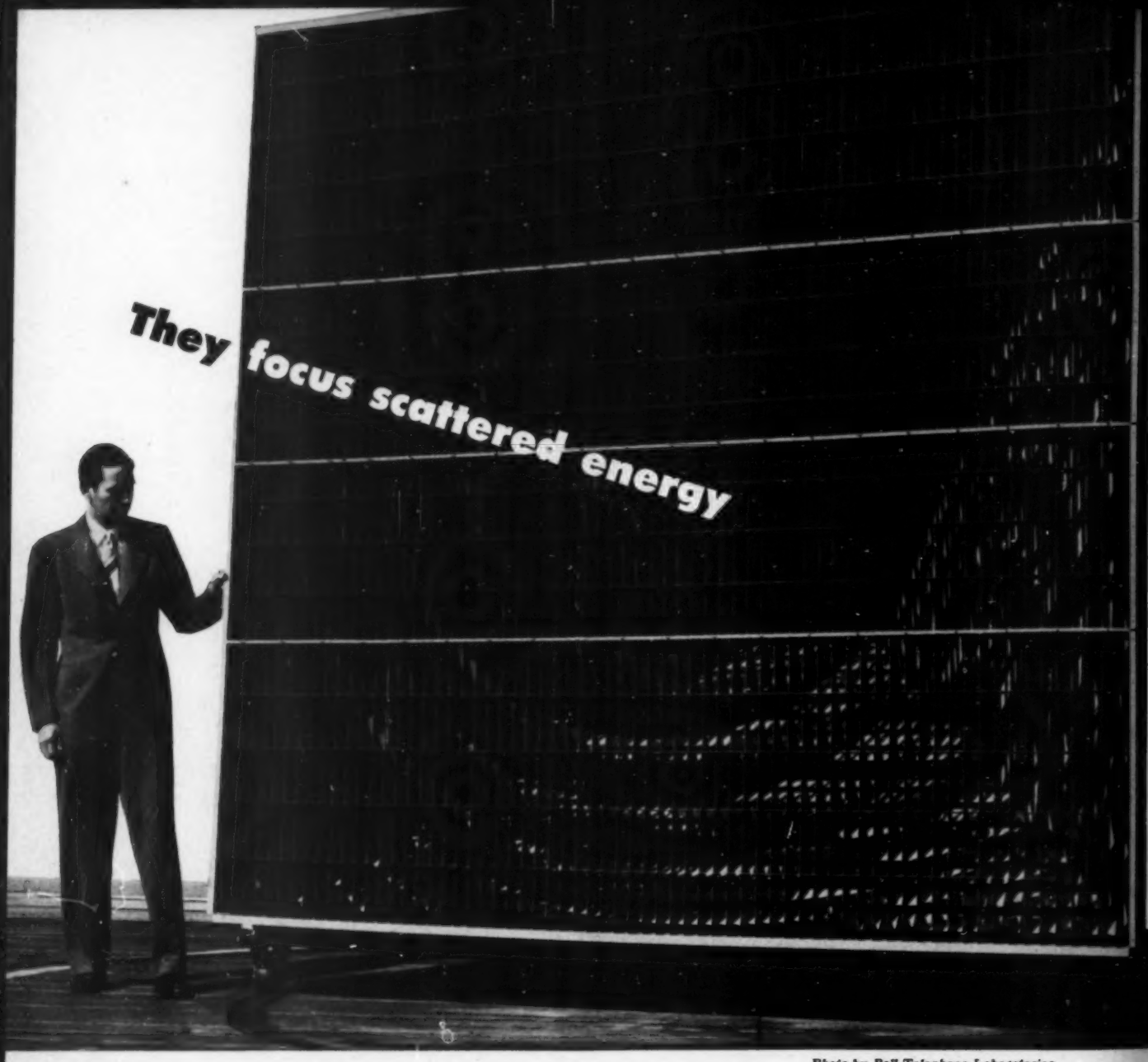

Photo by Bell Telephone Laboratories

Energy when kindled but not controlled spreads in all directions, a waste that is foe to achievement in every department of life. In the field of science, to collect and make more effective use of microwaves in radio transmission, engineers of the Bell Telephone Company have devised a huge metal grid which focuses these microwaves just like a magnifying glass focuses the rays of the sun.

In the field of the development of the human personality, educators seek constantly and with the greatest understanding for means to collect and focus the energies of the growing youngsters in their care. For such men know what a mystery adult life with its serious demands presents to these puzzled children whose chiefest concern has been the irresponsible enjoyment of play. Yet it is toward adult responsibility the youngsters must be drawn, in preparation for which their attention and energy must be increasingly concentrated.

Wise educators meet the need by seizing the opportunities presented within the confines of the curriculum and the classroom. None has *greater* opportunity than the instructor in mechanical drafting. For in the freshness of the subject and the skills toward which the work leads, he can arouse an overwhelming interest that will focus the student's attention. In the rudiments simply stated, he can give the student confidence. In the recited achievements of men who have come the same way and become engineers, the student gains an urge to go on. And the instructor will insist that a fine set of drafting instruments be placed in the student's hands. For the lad is at the transition step that separates adult activity from childish make-believe. And what can be expected if the instruments he uses shout "inconsistency!" every time he takes them up? How can niggardly economy ever make up for the opportunity that may here be lost?

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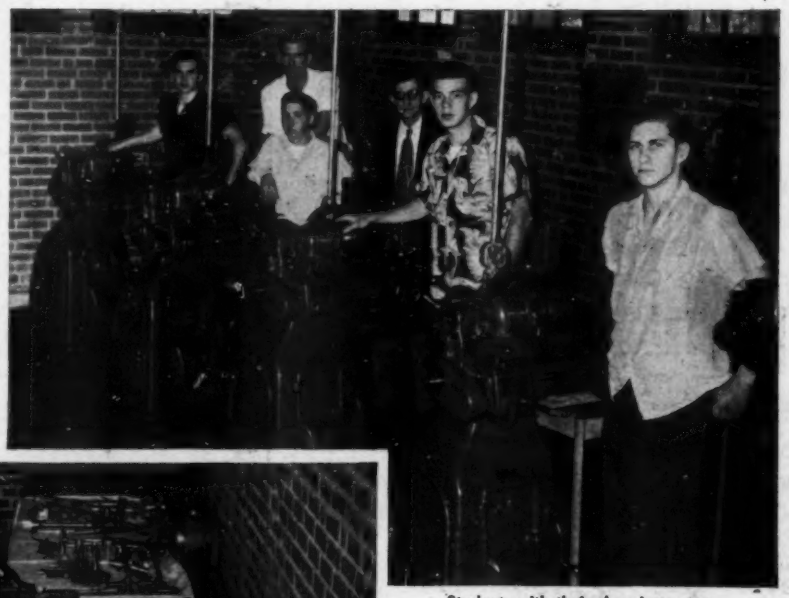
Machine Shop Students Make Remarkable Advancement Record

This country's industrial future will some day be in the hands of the youth who are students today. When we contemplate the responsibility that the future will hold for them, the present responsibility of vocational training commands greater respect. Consequently, all progress towards more effective training is a source of satisfaction not only as career insurance for students but as another step towards a more efficient industrial economy.

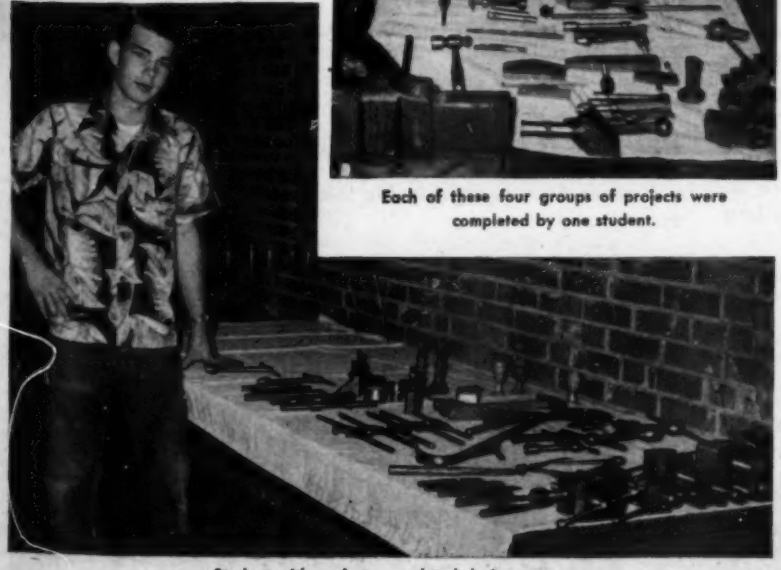
Thorough Training Pays

An outstanding example of student advancement has recently come to our attention. The students pictured here constituted the machine shop class of the Leavelle McCampbell High School of Graniteville, S. C. The displays of projects that they have completed during the past school year is remarkable proof of their rapid advancement. Such an achievement is testimony to what can be accomplished through thorough training. The credit for this is due their instructor, Mr. S. P. Ward. There should be no concern about industry's future when training records such as this are being achieved.



Students with their shop instructor, Mr. S. P. Ward.

Each of these four groups of projects were completed by one student.



Student with projects completed during year.

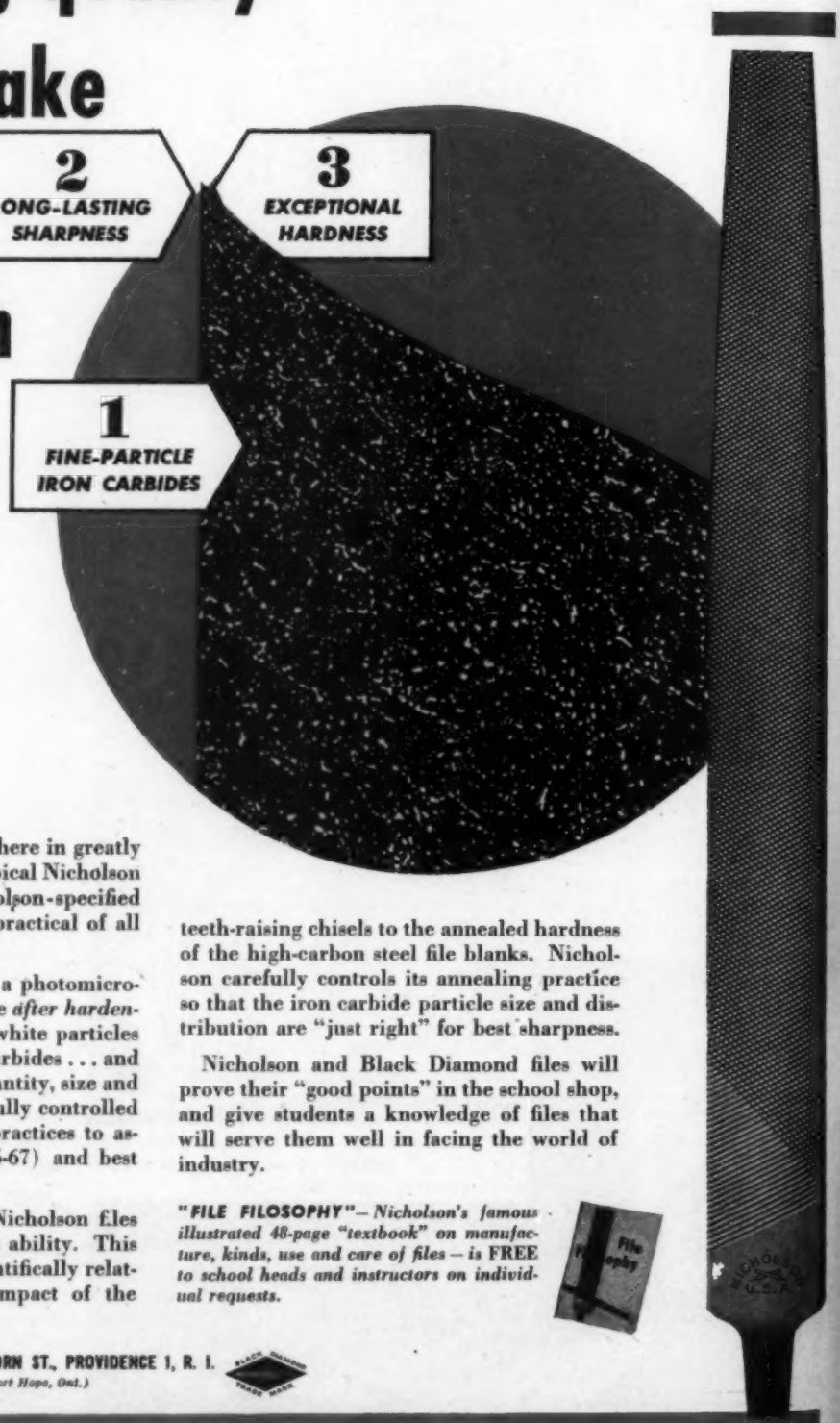
Select Right Equipment

Highly important to the efficiency of any vocational course is the selection of the right equipment. In this school, as in countless secondary schools, universities and trade schools, South Bend Lathes are preferred. Shop instructors have long known that their ease of operation, simplified design, versatility and accuracy make training easier as students become adept at machine handling faster. Also, they are widely used in industry which makes training more effective—re-training on the job is often eliminated.

There are also South Bend Drill Presses and Shapers that are ideal for school shops. It will pay you to find out more about all of these South Bend machine tools. Just write to South Bend Lathe Works, South Bend 22, Indiana for complete information.

Advertisement

Three big quality points make great file-teeth points



THE pointed shape you see here in greatly exaggerated size is that of a typical Nicholson file tooth made from Nicholson-specified high-carbon steel — the most practical of all materials for files.

The mottled area is part of a photomicrographed cross section of the file *after hardening.* Note the myriad of fine white particles — technically known as iron carbides . . . and of extreme hardness. Their quantity, size and uniform distribution are carefully controlled in Nicholson's metallurgical practices to assure maximum hardness (C66-67) and best wearing properties.

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Vol. 40 No. 10

DECEMBER, 1951

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

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This Month's Cover

The cover for the December issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION shows a shoe-repairing class at the Vocational High School in the 1951 AVA convention city, Minneapolis, Minn.

The photograph was submitted by John F. Robohm, consultant in industrial education in Minneapolis.

Buy Christmas Seals

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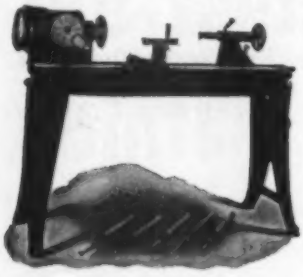
See this interesting practical demonstration of Metal Spinning!

"OLIVER" SPACE No. 100-101 AT THE A.V.A. CONVENTION



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Association News

THE COMING AVA CONVENTION

Minneapolis will be the mecca of teachers, supervisors, directors, co-ordinators, administrators, and others who are interested in industrial arts and vocational education, November 26 to December 1, 1951. They will assemble in that city to attend the annual convention of the American Vocational Association. Representatives of labor, business, industry, and the U. S. Office of Education will be in attendance. Besides these, of course, there will be teacher trainers and local and state supervisors and directors to conduct and attend the sectional meetings held by the members belonging to the various divisions, such as the agricultural, business, distributive education, part-time and full-time vocational education, home economics, trade and industry, vocational guidance, and industrial arts sections. Every effort will be made to bring all of these various educational endeavors in line so as to assist, as far as our schools can, the efforts of our armed forces in Korea and elsewhere, in their efforts to protect our country and the rest of the democratic countries, against a perfidious enemy.

The visitor at the AVA convention will have an excellent opportunity to visit and study vocational, industrial arts, and technical education schools and classes.

Dunwoody Industrial Institute and the University of Minnesota will be open for inspection and should attract very many, and those who can spare the time should visit some of the Minnesota area schools.

Last but not least is the opportunity to study the new equipment, tools, and materials which will be exhibited by the members of the "Ship."

The 1951 AVA convention is exceedingly important. Do not fail to attend if it is at all possible.

AVA GRAPHIC ARTS SECTION

Education for the printing industry will be stressed at the 45th annual convention of the American Vocational Association, which will be held in Minneapolis, Minn., November 26 to December 1, 1951. The "Graphic Arts Section" meeting will be held at the William Hood Dunwoody Industrial Institute on Friday, November 30. The general theme for this session will be "Modern Methods of Education and Training for the Graphic Arts."

NEW ALPHA-PI CHAPTER OF EPSILON PI TAU

On May 26, 1951, the forty-second chapter of Epsilon Pi Tau was installed at North Carolina State College, Raleigh, N. C., at which time twenty-six candidates were initiated into the new Alpha-Pi chapter of the fraternity.

Dr. William E. Warner, founder of Epsilon Pi Tau and of the American Industrial Arts Association and now executive director for the Civil Defense of the state of Ohio, with Dr. John R. Ludington, specialist in industrial arts, U. S. Office of Education, Washington, D. C., had the installation and initiation ceremonies.

At the installation banquet which followed the initiation ceremonies, Marshall L. Schmitt was toastmaster. Dr. William E. Warner delivered the charter address entitled "The Impact of Technology on American Education." Immediately following Dr. Warner's inspiring presentation, the charter members of the Alpha-Pi chapter of Epsilon Pi Tau were awarded the fraternity keys. Dr. Ivan Hostetler, head of the industrial arts department at North Carolina State College, was

(Continued on page 6A)

New Alpha-Pi Chapter of Epsilon Pi Tau

The charter members of the new chapter are: (Seated, left to right) — John Warren Smith, Dr. Ivan Hostetler, trustee, William M. Roach, vice-president, Warren L. Cartier, president, Robert T. Troxler, treasurer, Daniel C. Wise, secretary, Donald M. McCormick, Ralph Calvano
2nd row — Louis B. Beres, Claude R. Edwards, Clarence A. Russ, William G. Magvinese, Elmer H. Mades, Nile F. Hunt, Richard H. Rhyne, Frank E. Briley, Dr. Kenneth L. Bing
3rd row — John M. Jenkins, Jr., Richard T. Jones, Blondy E. Scott, James S. Travis, Jr., Billy L. Brown, Robert G. Thrower, William A. Cole, William A. Martin, Hilton L. Gay

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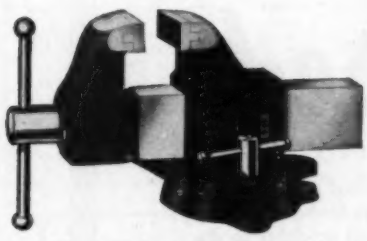

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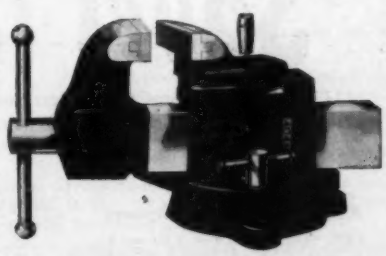

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ASSOCIATION NEWS

(Continued from page 4A)

made a laureate member of the fraternity and named trustee to the new Alpha-Pi chapter.—*Daniel C. Wise, Secretary.*

EPSILON PI TAU CHAPTER INSTALLED AT IOWA STATE COLLEGE

A chapter of Epsilon Pi Tau, international honorary professional society in industrial arts and industrial vocational education was installed at Iowa State College Saturday, April 28, 1951.

A group of 44 initiates were accepted by the society and included 21 undergraduates, 8 graduates, 12 men engaged in teaching industrial arts or in the administration of industrial education in Iowa, and 3 faculty members.

The charter address was given by Dr. William E. Warner of Ohio State University. His subject was "The Impact of Technology on American Education."

The initiating team was made up of members of Epsilon Pi Tau from Stout Institute, Menominee, Wis.; Northern Illinois State Teachers College, DeKalb, Ill.; Ohio State University, Columbus, Ohio; Fresno State Teachers College, Fresno, Calif.; Nebraska State Teachers College, Peru, Neb.; Washington State College, Pullman, Wash.; and Iowa State Teachers College, Cedar Falls, Iowa.

The initiates were:

Undergraduate: Robert Anders, Radcliffe; Maurice Alsin, Madrid; Carl Anderson, Weldon; John Baldridge, Des Moines; Leonard Bengtson, Colo.; Paul Buegel, Fort Dodge; Robert Butler, Dows; Marion Green, Gilman; Howard Hammond, Slater; Robert Harger, Cedar Rapids; William McKeown, Honey Creek; Kenneth Mann, Fort Dodge; Keith Meek, Ames; Robert Mitchell, Hudson; Wilbur Moeller, Walcott; Raymond Nielsen, Waterloo; Howard Parks, Cedar Rapids; Jerry Phillips, Omaha, Neb.; Walter Runyan, Braddyville; Gerald Sielert, Cresbard, South Dakota; Hans Walther, Plainfield.

Graduate: William Aylsworth, Wadena; Lowell Fisk, Scarville; John Green, Sheffield; Kenneth Kessler, Des Moines; Edward Morris, Ames; Dick Dyas, Maquoketa; Wesley Viilo, Dafter, Mich.; Robert Weber, Harlan.

Faculty: E. S. Baird, L. L. Carver, Durwin Hanson.

In the Field: Harry W. Carmichael, Des Moines; Leslie Grigg, Cedar Rapids; Frank Judish, Fort Dodge; Harry Leake, Burlington; Charles McCoy, Davenport; Clifton Matz, Bettendorf; John Oxenford, Ames; Lawrence Simmering, Ames; Edwin Stone, Boone; Lewis Wass, Davenport; Eugene Welte, Richmond; Roy Woolman, Des Moines.

EPSILON PI TAU INITIATION AT INDIANA STATE

Mu chapter of Epsilon Pi Tau at Indiana State Teachers College inducted ten new members at its summer initiation ceremonies in the Student Union formal lounge. The new members were guests of the fraternity at a dinner in the evening.

Professor Arthur Luehring, who retired from teaching at the end of the 1950–51 school year and who rendered long and distinguished service as faculty trustee for the fraternity, served as

(Continued on page 22A)

These Five Distinguished Judges

WILL DECIDE THE WINNERS in the Delta SCHOOL SHOP LAYOUT CONTEST

DR. C. H. GRONEMAN
Head, Industrial Education
Texas A. & M. College
College Station, Texas

B.S., M.S.—Kansas State Teachers College • Ed.D.—Penn State College • Machinist—Industrial Arts Teacher, Schools and Colleges, Okla. Texas • Author, Consulting Editor, Ind. Arts, McGraw-Hill Publications.

DR. WILLIAM W. THEISSEN
Asst. Supt. of Schools
Milwaukee Public Schools
Milwaukee, Wis.

B.S.—University of Wisconsin • M.S., Ph.D.—Teachers College, Columbia Univ. • Nat'l Council on School House Constr. • Associate Editor, Journal of Educ. Research Assn. • Year Book Commission AASA, 1935-50 •

DR. C. C. CAVENY
Dean, Chicago Campus
University of Illinois

B.S.—University of Pittsburgh • Graduate degrees—University of Pittsburgh, Penn St. College, Tech. School Teacher, Administrator, Penn., Ill. • State Superintendent, T. & I., Penn. • Special Repr. U.S. Office of Education • State Director, Nat'l Def. Training, Ill. • Captain, U.S. Navy, World War II.

HANS W. SCHMIDT
Former Supervisor,
School Building Service,
State Dept. of Education
Madison, Wis.

Degrees: University of Minnesota and University of Berlin • Instructor, Supervisor of Industrial Arts, Teacher Trainer • National Consultant on School Building Planning and Construction.

GILBERT G. WEAVER
Director of Training,
Bureau of Vocational
Curriculum, Development
and Industrial Teacher
Training, State Education
Dept., New York, New York

B.S., M.S.—University of Pittsburgh • Engineering
Penn. State College • Machinist, Industrial Supervisor • International Consultant in Vocational Education.

Prizes to be awarded concurrently with the **AVA CONVENTION, Boston, November, 1952**

To judge impartially the entries in the nationwide Delta School Shop Layout Contest—from the standpoint of teaching efficiency, administrative compatibility and architectural soundness—Delta has asked these outstanding school men to serve as the Contest Judges. Distinguished in the field of industrial arts and vocational education, they alone will determine the winners—and their decision will be final.

Delta, maker of the world's broadest line of industrial power tools, is sponsoring this contest to stimulate, compile and distribute the most advanced ideas concerning school shop planning. What is more natural than to seek the school shop ideas of *you* who are best qualified to generate them—the nation's instructors, supervisors and administrators actively identified with school shops; and to reward those of you who develop the plans deemed best by the judges?

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SIX PRIZES—each $350 worth of Delta Tools, your own selection—for the best school shop layout in each of the six following divisions:

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4. **Senior High School Shops—10th, 11th, 12th Grades**
5. **Technical High School Shops—Trade Schools, Vocational, Continuation and Part-Time and Adult Education Schools**
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- **Official Entry Form**

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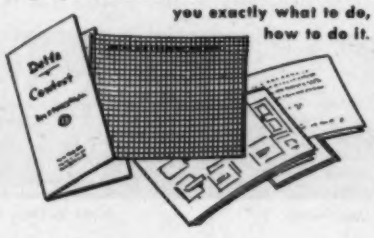

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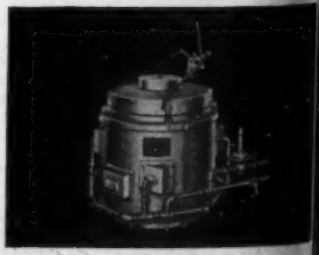
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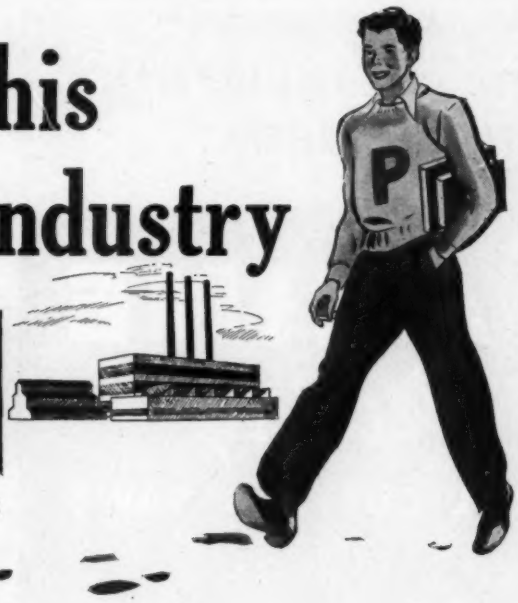

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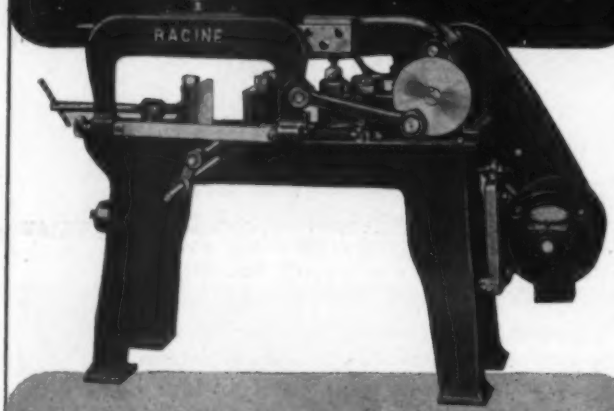

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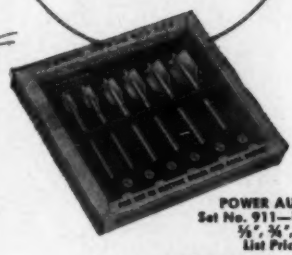

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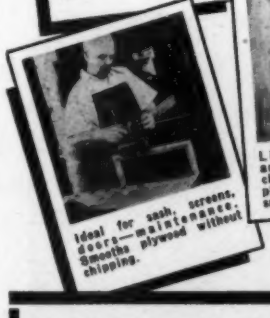
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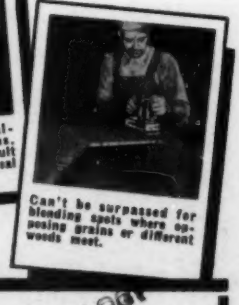
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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

DECEMBER 1951

Industrial Education in Minneapolis— A Historical Sketch

JOHN F. ROBOHM
Consultant in Industrial Education
Minneapolis, Minn.

The opening of school in September of 1887 saw a new course ushered into the curriculum of the Minneapolis Public Schools. At the old Central High School on Fourth Avenue South and Eleventh Street, a manual-training course in woodworking was being offered for boys. W. F. Decker was its first teacher, and six workbenches were provided with equipment for two classes. However, the demand for this new work was so great that additional equipment for four classes of ten boys each had to be provided.

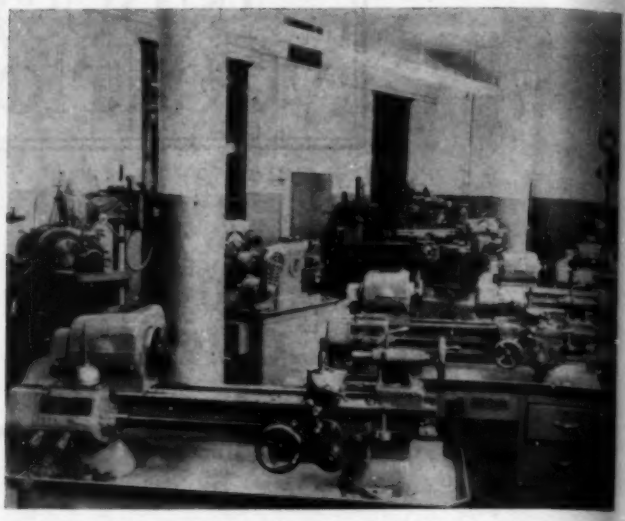
Thus humbly began the great industrial-arts training program in Minneapolis, progressing through the stages of sloyd work in the elementary grades with woodworking and mechanical drawing in the high schools, to its present status. The growth of the junior high school movement with its emphasis on exploratory courses in the early 1920's was a decided influence in increasing the provision of this work and of modifying the offering of subjects.

J. E. Painter, as supervisor, provided the leadership in this field almost from the beginning; and his influence made the program outstanding during the years of its expansion and development. After his untimely death, C. K. Lush continued to develop and strengthen the courses particularly on the junior high level.

Today there are eleven junior highs, three junior-senior highs, and seven senior high schools. The standard industrial-arts courses offered in junior highs consist of five shop experiences — general woodworking, mechanical drawing, general metalwork, plastics, electricity, and graphic arts. Each course is one semester in length and, for his sixth semester, a student may elect a second term of work in any of the five shop subjects.

The industrial-arts courses on the senior high level vary considerably among the different schools. The shop types offered are dependent on the nature and needs of the school districts, with the age and tradition of the schools likewise being con-

At left — Manual training class, about fifty years ago, at the old Sheridan Elementary School. At Right — Woodworking class at Roosevelt High School



At left — Electric shop at Ramsey Junior High School. At right — New machine shop at South High School.

trolling factors. Woodworking shops and mechanical-drawing rooms are included in all schools and, with one exception, metalworking shops also are provided.

At Roosevelt High, the largest of the senior high schools, the program is most complete — eight industrial-arts experiences being provided which include auto mechanics, general metals, machine shop, graphic arts, general woodworking, cabinetmaking, mechanical drawing, and advanced machine and architectural drawing. This school also has the only vocational agriculture department in the city school system. It has an excellent farm shop, and any boy in the city who wishes to take the agriculture course may transfer to Roosevelt.

While the secondary school enrollment in Minneapolis is down somewhat as we have not yet worked out of the doldrums caused by the depression years, there are 9519 boys and girls taking industrial-arts courses. We have 92 teachers and 118 shops in our schools although a number of the shops are at present only in use part time.

The trend is toward generalization of our courses while maintaining unit-type shops, so that now instead of printing we teach graphic arts, and in place of sheet metal, general metalworking and the like, thus broadening our course content in each of the subject areas.

Vocational education had its inception in Minneapolis several years prior to the passage of the Smith-Hughes Law. It was in 1914 that the Girls' Vocational School was opened, in the Old Central High building, with Miss Elizabeth Fish as principal. About seven years later, in 1921, some trade courses for boys were added; but as the school's enrollment increased with the passing years, in 1926 a separate Boys' Vocational School was started in the old East High building. M. S. Olsen was its principal, and there were only three trades represented — cabinetmaking, electricity, and tailoring. Auto mechanics was added in 1928 when this department was moved from its old location at the Girls' Vocational in order to clear the site for a new building.

The year 1928 was significant in another way, for Dean M. Schweickhard was appointed director of Vocational Education. With a more favorable attitude toward vocational training on the part of the school administration, the growth of this work was phenomenal over the next decade. In 1930, the writer of this sketch was named principal of the Boys' Vocational School; and in rapid succession new courses were added as the need for them was shown in industry until, by 1940, the enrollment had increased from about 200 to 872 boys and the courses from 4 to 15.

The present Minneapolis Vocational High School and Technical Institute has resulted from combining the two old schools, Girls' Vocational and Boys' Vocational. The wing for girls' trades, known for a time as the Miller Vocational, was completed first, being opened in 1933, and that for the boys in 1940. Now, with R. V. Nord as principal, it offers training courses in some 30 different trades and has an enrollment of about 1400 day-school students, both boys and girls, plus some 350 veterans in accelerated courses. The total evening school enrollment numbers about 3350 persons a week.

It seems appropriate at this time to give a few words of tribute to one of the pioneers of vocational education in Minneapolis, its first director, John N. Greer. He foresaw the need for industrial training and laid the groundwork for the present program. As early as 1920 he envisioned a large vocational high school on the site of the old Central High where the present building is located. Unfortunately, death took him from us before he could see the fruition of his dreams.

The vocational training for adults received a tremendous stimulus with the War Production Training movement. During the World War II years, 19,000 men and women were trained for jobs both in T.W.I. and in-school classes. Scarcely had the war training ceased when the influx of veterans began.

This caused a further adjustment in the school, both administratively to provide the time and facilities for veterans' training, and educationally to set up accelerated courses on the adult level. In order to meet this situation, N. E. Jensen was named assistant to the principal in charge of veterans' training, and J. R. Fausch was assigned as teacher-trainer to help the large number of temporary teachers from industry to become adjusted as teachers, as well as to improve the courses of instruction. How well they have done their work can be attested to by the thousands of veterans who have been trained and placed

At left — Graphic arts at Sheridan Junior High School. At right — Tailoring class at Vocational High School

in jobs during the past six years. There are still 350 veteran students in training.

The Evening Trade Extension courses and apprenticeship training likewise received great impetus from both war production and veterans' training programs. Today, under the supervision of Glen D. Jadwin, there are 600 adult evening T & I students in addition to 400 indentured apprentices enrolled in our classes.

The demand for business and distributive education courses is also on the increase. Milo A. Latterell supervises this program and reports an enrollment of 850 students this year. Another expanding service is that of part-time co-operative training. Miss Margaret E. Andrews furnishes the leadership for this work.

Adult homemaking courses have long had a place in our school system. Now, with more community centers being opened for evening adult classes, Miss Ann Krost, the consultant for this work, reports that there are 1800 people enrolled in these classes at present.

At about the same time that Miss Fish was starting the Girls' Vocational School, a private trade school for boys and men had its small beginning. This was the William Hood Dunwoody Industrial Institute which through the years has grown and flourished until its name is almost synonymous with Minneapolis in the field of vocational education.

Here Dr. C. A. Prosser lived and labored, and with his two assistants, Ralph T. Craigo and M. Reed Bass, built an institution for training of such soundness that its reputation is world wide. At present, under the direction of J. R. Kingman, Jr., with John A. Butler and W. F. Sahlin as assistants, Dunwoody continues to live up to its reputation with an enrollment of 900 day school and 1500 evening school students all in T & I courses.

Minneapolis also is the home of the University of Minnesota, one of the largest in the United States. Here, under the wise guidance of Dr. Homer J. Smith, the Industrial Education Department has developed into one of the foremost in this country. In fact, a large number of educational leaders in our field today have received either their bachelor's or advanced degrees from this institution of learning. In addition to Homer Smith, the list of those who have been or still are at Minnesota "U" in an instructoral capacity contains such illustrious names as A. F. Payne, Charles R. Allen, C. A. Prosser, R. A. McGee, Verne C. Fryklund, William J. Micheels, and H. T. Widdowson.

Thus, it would seem that in all phases of industrial education over the past 64 years, Minneapolis has furnished its share of leadership as well as the training programs and physical facilities. We do not anticipate any deviation from this course in the future.

Industrial Education Awards Contest

WALTER J. ROBINSON
Professor, Industrial Education
Northwestern State College
Natchitoches, La.

We are living in an age of competition. If we agree that education is living instead of preparing for life, then industrial arts and vocational-industrial education can participate more actively in the realization of this objective through promoting the competitive spirit among students enrolled in the various industrial courses.

In 1947, the department of industrial education at Northwestern State College, Natchitoches, Louisiana, organized an industrial-arts club. One of the most important objectives adopted by this club was the promotion of industrial education in Louisiana. To fulfill this aim a major activity related to some phase of industrial education has been sponsored each year. The project decided upon for 1950–51 was a state-wide contest in industrial education. Approval for this undertaking was secured from the state supervisors of industrial arts and trade and industrial education. A committee from the club was appointed to work with the industrial-

Winning projects in all groups — woodworking industrial-education contest, Northwestern State College

education department at the college in planning details for the contest. The committee decided to pattern the contest largely after the Ford Industrial Arts Awards Contest, whereby it might be used as a screening process for projects that were to enter the Ford Regional Contest in Kansas City.

The rules agreed upon to govern the contest were:

1. The contest will be limited to areas in industrial arts and vocational-industrial shop students as listed on the entry blank.

2. Each boy will bring or send his project to Northwestern State College on or before April 28, after having it officially entered by his instructor.

3. Instructors sending contestants will prepare 15 to 20 objective test questions over the area in which the project has been entered. These questions will be combined with questions furnished by other instructors who enter contestants in the same area.

4. Each student entering a project will be tested over the area in which his project has been entered.

5. Each winner will be determined by the combined score made on his project and the objective test.

6. Students entering any phase of the drawing contest will be expected to exhibit samples of drawings completed in addition to taking the test in drawing.

7. Awards in the form of certificates will be given to winners in the contest. Students making the highest score in each of the four groups will be awarded a scholarship to Northwestern State College. (This scholarship provides for the waiving of registration and all laboratory fees.)

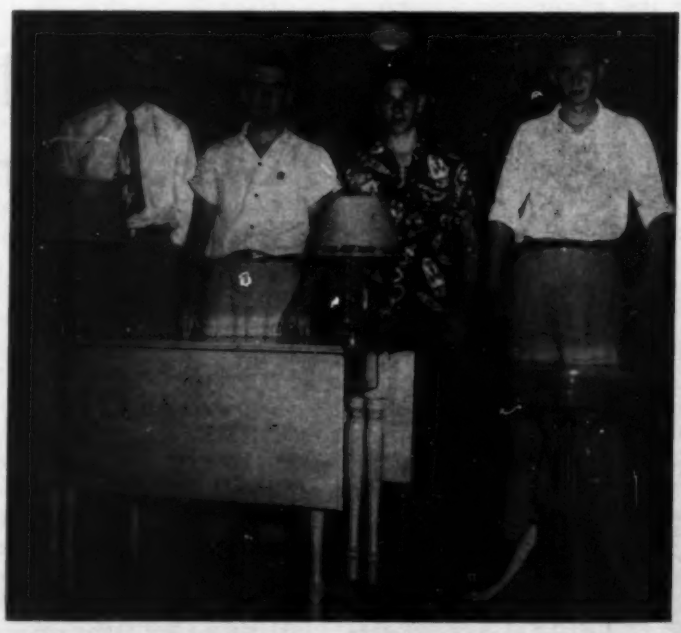
8. Students making the highest score in each area, test omitted, will enter their work in the Ford Industrial Arts Regional Contest to be held in Kansas City.

The score card used for project evaluation was divided into three parts: design, construction, and finish. Twenty points were allowed for design, 45 for construction, and 35 for the finish. The method used in scoring drawing plates consisted of allowing 25 points for each of the following: accuracy, neatness, lines, figures and lettering.

The purpose of administering a test in connection with the contest was to emphasize the general education value of industrial education along with proficiency in craftsmanship. Test questions submitted by instructors which did not comply with the instructions were eliminated, and the department of industrial education added a sufficient number to total 100 points. College majors in industrial education administered all tests and computed winners. Judges on craftsmanship were Dr. T. E. Hampton, supervisor of Trade and Industrial Education, and H. O. Thomas, supervisor of Industrial Arts for Louisiana. After combining test and project evaluation scores each contestant was rated with his respective group. The method of rating was: superior for those making a score between 90–100 per cent, excellent between 80–90 per cent, very good 70–79 per cent, and good 60–69 per cent.

The contest closed by showing the film, "The Pride of Craftsmanship," a Ford Motor Company Production, and the awarding of certificates to the winners.

In view of the initial success and interest created among students and teachers who participated in the contest, the department of industrial education at Northwestern State College decided to make the contest an annual affair. It is the plan of the department to encourage entrance of diversified projects which will greater represent the total industrial education program.



Winning projects in furniture making and woodworking industrial-education contest, Northwestern State College

The values to be derived from conducting a contest in industrial education either on a local or state-wide basis are numerous. The following results seemed to stem from the one conducted at this college:

1. It provided an opportunity for high school students in industrial and vocational-industrial classes to participate in a contest comparable to those participated in by music and literary-minded students. As a result the barrier commonly found existing between these groups is eliminated. It makes for a more homogeneous student body.

2. Encourages and develops good public relations, both for the schools participating and the sponsoring institution.

3. It creates more interest and motivates the student enrolled in industrial education courses. He will not only strive to excell in craftsmanship, but will see the need for related instruction.

4. The contest affords an opportunity for the selection of potential industrial education instructors.

5. It is definitely educational. Some schools that did not enter contestants sent representatives to the college to see the exhibits and observe how the contest was conducted. They expect to enter students next year. It was an educational experience for majors in industrial education to plan the contest and administer the testing phase.

6. For Louisiana, a state that is rapidly expanding her industrial education program, the contest's promotional value is unlimited.

7. Serves as a means of selecting projects to compete in regional contests, thus eliminating expense of transportation of work that is not suitable contest material.

8. It provides an opportunity for students and teachers to compare their work with that produced by students enrolled in similar programs in the state.

Vocational Education in the Trade and Technical Division of the Detroit Public Schools

EARL L. BEDELL
Divisional Director
Vocational Education
and
ANDREW D. ALTHOUSE
Supervisor, Vocational Education
Detroit Public Schools
Detroit, Mich.

In line with an established plan to keep the citizens of Detroit, Mich., informed concerning the various activities in the Detroit schools, various departments in the schools exhibit pictures of their activities. Last year (September, 1950) this exhibit featured industrial arts. This year's exhibit features trade and technical education. Visitors to the exhibit were given a small folder containing the following explanatory statements. In this way parents and others are given an understanding of what trade and technical education is and what it is doing for the youth of Detroit.

Vocational education in Detroit's technical and trade schools has as its major purpose the preparation of boys and girls for work.

Emphasis is placed on the acquiring of a good basic education by our youth. Shop, laboratory work, and machine operations form the basis for related studies in drafting, mathematics, science, English, and the social studies, but do not replace these subjects. Rather, they give meaning to them through the solution of practical problems.

The pictures in this exhibit have been selected to show some of the training activities in the technical and trade schools.

Extent of the Program

Ten schools comprise the technical and trade school division. Seven schools are designated as trade schools located in widely separated parts of the city and are devoted to the occupational needs of both boys and girls between the ages of 15 and 18.

One technical high school serves both boys and girls in the technical fields. One high school is organized on the co-operative plan. An aeromechanics high school qualifies young men for federal licenses as airplane and airplane engine mechanics.

What It Is

Detroit, like all large industrial areas, requires the services of a large number of trained men and women to serve in a great diversity of trades and occupations. Accordingly, the Detroit schools attempt to provide basic vocational education for high school youth in a great diversity of occupations. Such fields include transportation, communication, merchandising, food service, clothing services, and housing.

How Vocational Work Is Taught

Manipulative skills are taught in basic shop courses. However, every basic shop course is supported by English and social studies, as well as by related mathematics, drafting, and science. In other words, the student in a technical or trade school receives a complete education.

Woodworking

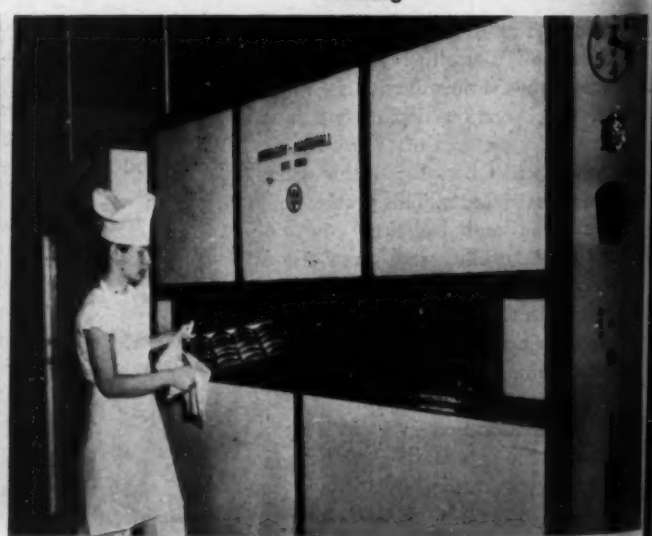
Electricity

Drafting

Aeronautics

Printing

Decorative art



Commercial foods service

Science and theory

Science of living things

In each shop or laboratory the housing and equipment is planned to reflect the atmosphere of the particular industrial field. For instance, the commercial foods department in the trade school is set up like a large hotel, or restaurant with kitchen and bakery. The equipment, including stoves, ovens, kettles, walk-in refrigerators, dish washer, and the like, is a duplicate of that used in commercial establishments. The foods prepared are sold or served to groups of students in a typical cafeteria. The staff consists of men and women who, in addition to having earned recognized degrees and teachers' certificates, have served the commercial foods trades in various assignments for many years. Graduates from these departments are at home in any type of commercial food establishment.

In all vocational training areas, the room and equipment facilities are comparable with the foods trades facilities mentioned above.

A future exhibit is planned which will feature the program of education for employed apprentices and adults who desire to improve their job status. It should be emphasized that this exhibit presents the type of training given to youth of high school age and who would be normally in grades 9 through 12.

Vocational Education in the Technical and Trade Schools of Detroit

1. Needle Trades. Many fine garments are produced in the tailoring and dressmaking classes. Detroit's clothing establishments are in constant need of both men and women who have these skills.

2. Decorative Art. Real jobs of interior decoration are planned and executed by the classes in painting and paperhanging.

3. Commercial Foods Service. Student cooks and bakers use commercial equipment in their training.

4. Science and Theory. Science and theory support all shopwork. Here we see a boy studying a microphotograph to determine the characteristics of a weld which he has made.

5. Aeronautics. Before rebuilt airplanes are flown away, each ship is given a com-

Merchandising

Needle trades

plete weight and balance test by student airplane and airplane engine mechanics.

6. Drafting. Drafting includes the use of handbooks and computation procedures required for design work as well as "lines and letters."

7. Science of Living Things. This science class is growing plants which the students will take home in the spring to plant in their gardens. Raising turkeys for Thanksgiving is another activity.

8. Woodworking. Skill in woodworking is fundamental in many trades.

9. Merchandising. Making out sales slips and wrapping articles are important activities in training for retailing.

10. Printing. Many future "Benjamin Franklins" receive their practical and theoretical printing fundamentals in this school print shop.

11. Electricity. The electrical industry requires young men who can use electrical instruments in both the installation and maintenance of electrical equipment.

Leaders in Industrial Education

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(Continued from page 355 of the November, 1951, issue)

FRANK MITCHELL LEAVITT (Continued)

A Suggestive Course of Study

The significance of the contribution that came out of the experiments in Boston appeared in the large number of cities that drew on these outlines and suggestions in establishing manual training courses during the years that followed. In 1892, Leavitt was promoted to the position of principal of manual training schools, and in 1901 he brought together the results of the intervening years of experience and published a *course of study* in manual training for grades seven, eight, and nine, accompanied by photographs of the completed models, working drawings, and outlines of the tool processes involved.

In Mr. Bennett's summary, "The Swedish idea of useful models had prevailed; the Russian idea of class instruction, supplemented by individual help, had not been abandoned. To a limited extent, modeling and curved forms, also chip carving, characteristic of the Swedish work, were included; the American and Russian use of mechanical drawing was emphasized. To some extent, the rigid course of models had become more flexible; working drawings of suggested optional models were included in the published course."

The Russian system of abstract tool exercises and the Swedish sloyd were the two most influential factors in determining form and content in the beginnings of manual training instruction in the elementary schools of the United States. But as time went on other factors came in to modify methods and practices until, by 1918, "hardly more than shadows of the original Russian and Swedish systems remained in most of the progressive American courses. . . . To develop courses and methods that would include the best features of both these systems and be in harmony with the best American practice in the crafts and with American educational ideals became the problem of thoughtful teachers of manual training."

An Accomplishment

I am not able to write of the Boston period of Leavitt's career from firsthand observation, for, as already indicated, our personal acquaintance did not begin until later, and my first visit to Boston came in 1913, after Leavitt's departure. However, I do recall very distinctly the recognition and esteem accorded him by his contemporaries who were in a much better position than I to appraise and appreciate his achievements at that period.

One circumstance of the Boston period deserves mention, although I did not come to know about it until several years later. Leavitt was a lover of fine classical music. He had a good baritone voice, and for many years was a member of the chorus of the Handel and Haydn Society of Boston, one of the oldest and best known choral ensembles in the United States. He served several terms on the board of directors of the Society, was a member of the Voice Committee, and finally served as librarian. He was a constant attendant at the concerts of the Boston Symphony Orchestra. It is probably not too much to record that music was for him something more than a hobby or accomplishment, if indeed it was not an avocation.

The University Professor

It is difficult to write constructively and fully of the University of Chicago period, 1910–18, for the lapse of more than 30 years has dimmed many of the recollections.

For the University it was an interlude of purposeful and fruitful attention to the vital problems of industrial education, between long intervals of neglect and pretermission. It seems in-

credible that an otherwise great university should at any period, or for any appreciable length of time, officially adopt a partial and incomplete concept of education. To be consistent with its claims that all fields of knowledge, all epochs of history, and all interests and experiences of mankind are its proper concern, the university may reasonably be expected in its provision for the study of education to include within its purview all the basic manifestations of growth and development in the human being — physical, intellectual, emotional, spiritual — and the essential correlations and co-ordinations among these various aspects.

For long periods, through the leadership which has held sway in its College of Education, and lately through its obsession with and almost exclusive emphasis upon the so-called *humanities*, the University of Chicago has been neglectful of when it has not been actually inhospitable to various special forms or aspects of education, of which the study of the constructive, manipulative, and exploratory activities of the growing child is only one. There is no special point in directing these strictures upon the University of Chicago, for many other institutions of higher learning have taken and still take the same myopic and incomplete view of the meaning and function of education. And it is probably futile to speculate upon the reformation that would take place in our public school system if the colleges and universities could somehow be persuaded to envisage the complete problems of education in its entirety.

It was in the relatively inhospitable and unpromising environment provided by one of the great universities of the Middle West that Frank M. Leavitt spent eight fruitful years. For it is certain that, however much or little he was able to modify his immediate environment, Leavitt made a major contribution to the progress of industrial education in the United States during this period. By frequent appearances before professional meetings of teachers and administrators he contributed more than can ever be adequately assessed to the discussion of emergent and recurring problems, and thus to the evolution of thought regarding the place and importance of industrial arts and industrial education. He was largely responsible for formulating a sane exposition of the proper relationship between manual training (industrial arts) and industrial education, and the place of both in the over-all scheme of vocational education.

In the offering of courses in industrial education at the University of Chicago, the chief emphasis was given to problems of organization and administration. The effort was made to develop in superintendents, principals, and teachers an intelligent interest in the whole field of vocational education, including industrial education and foundation work in industrial arts, as well as accurate information regarding sound principles and practices in the several types of schools in the various parts of the country. Little if any effort was made to prepare teachers of specific subjects in shopwork or drafting, hence only a minimum of provision was made for technical training in any of these subjects.

In 1912, Professor Leavitt offered at the University of Chicago the first course in vocational guidance in the United States to receive graduate credit.

For purposes of observation, and to provide opportunity for practical examples of certain features of industrial education under discussion, a special industrial class was maintained during the periods of heaviest enrollments in the summer quarters. The class was made up of boys 14 years of age or over, from the sixth and seventh grades, and the instruction was provided by special teachers representing four or five different lines of shopwork. Advanced students were given opportunity to assist in various ways in the instruction and in the management of the shop.

It was observed at that time that the demand for teachers and directors so far exceeded the available supply that "most teachers go into the work only partially prepared. These are encouraged to return year by year for additional training and inspiration, and many respond."

Misdirected Criticism

During this period, it is to be noted, a generation of advocates and promoters of industrial education arose who deemed it expedient to try to advance their interests by belittling the work and efforts of others. In preparing the chapter on "Vocational Education" for the *Annual Report of the Commissioner of Education* for 1914, I felt obliged to take cognizance of this situation by including the following observations concerning this attitude.[3]

"It may be well to call attention to the fact that during the past year there have been a number of ill-considered attacks upon public school work in manual training and the household arts, made by overzealous advocates of what they are pleased to call "real" vocational education. These criticisms seem to be animated by the notion that the best way, or one good way, to advance the cause of vocational education in the public schools is to discredit the work attempted under the name of manual training. . . .

"There are clear and unmistakable distinctions between vocational training . . . and the work now done in many school systems as manual training and household arts. There is no need of confusing the two. It must be acknowledged . . . that the best of the manual training work is just as essential and just as defensible as a part of the complete plan of education as anything that has yet been suggested under the name of vocational education. . . . There is a better way to advance the interests of vocational education than to tear down or discredit anything that is worth while in the other departments of the school system."

I recall that after the Commissioner's Report appeared in print I received a number of letters commending the stand taken in these paragraphs, and deprecating the statements made by the misguided advocates of the newer vocational education. A good deal of harm was done among superintendents and principals who were seeking the light, and constantly studying the new concepts that were stirring the educational world. Among other things that contributed to the confusion, the more intelligent and observing superintendents and principals were unable to understand and reconcile the diatribes of the more vocal critics with their own satisfactory experiences with manual-training and household-arts programs in their own schools. I refer to these controversies at this point because Mr. Leavitt played a prominent part in helping to resolve the difficulties.

During this period of criticism, confusion, and recrimination, which lasted with fluctuating violence for well over two decades, and involved some of the national leaders in industrial and vocational education who should have been more temperate and better balanced in their pronouncements, Professor Leavitt's voice and

[3]Bawden, Progress in Vocational Education, *Report of the Commissioner of Education*, for the year ended June 30, 1914. Vol. 1, Chapter XI, pp. 239–289 (Washington, D. C.: Government Printing Office).

pen were among the potent restraining and stabilizing influences. The modern movement for vocational education, as already pointed out, may be considered to trace its origin to the reports of the two so-called Douglas Commissions of 1906 and 1908, in Massachusetts. It is significant that from the very beginning of the movement a considerable number of influential leaders in key positions have been identified with dual programs of industrial arts *and* vocational education. Leavitt was a conspicuous and respected member of this group for nearly 30 years. Collectively they were a vital influence in "keeping the boat on an even keel" during a trying period.

Before leaving this phase of Leavitt's career, it should be recorded that he made frequent appearances before nonprofessional audiences of businessmen, manufacturers, and other employers, civic clubs, women's clubs, Parent-Teacher Associations, organized workers, and others. Through these contacts he was a potent influence in stimulating intelligent and purposeful discussion of the many problems of public education in which the people were becoming interested, and upon which they desired to be informed; and especially those problems relating to the newer, less traditional, and consequently less well understood special phases of industrial arts, home economics, commercial subjects, music, art, health education, physical education, guidance, and the various forms of vocational education.

The Portrait

The portrait accompanying this sketch was made from a photograph taken in 1914 or 1915, during the University of Chicago period, and approximately midway in Leavitt's career. Beginning at about the time of his acceptance of the appointment at Pittsburgh, 1918, Leavitt removed the mustache and goatee, and thereafter his face was smooth-shaven. In selecting a photograph, therefore, I was confronted with the necessity of a choice between two separate periods and two quite different aspects of personal appearance. I finally chose the earlier photograph, chiefly because of its historical appeal. For portrait see page 353, November issue.

Associate Superintendent of Schools

Dr. William M. Davidson (1863–1930) was superintendent of schools in Pittsburgh, Pa., for 16 years, 1914–30. One of the significant acts of his administration was the appointment, in 1918, of Frank M. Leavitt as associate superintendent, with responsibilities including industrial arts, home economics, and commercial subjects in elementary and secondary schools, a city-wide program of guidance, and a complete program of vocational education, including part-time, co-operative, day-trade, and evening schools. It should be added that Dr. Davidson believed thoroughly in the program, and gave Leavitt the constant support and encouragement which were important factors in the success of the work.

This appointment was noteworthy because, while not the first, it was at that time the most important large city to recognize the significance of the special branches of education enumerated, by creating the position and title of associate superintendent of schools for the administrative head of these activities. This assignment was recognized at once and acclaimed as a break with the traditional practice of placing these responsibilities in the hands of a supervisor or director.

This step was also widely perceived to be in even more violent contrast with the attitude of the colleges and universities, referred to above, many of which exhibited such slight comprehension of the significance of these so-called special subjects that little or no recognition was accorded them in their schemes of organization, or in their offerings. The appointment attracted nationwide attention and approval for another reason, namely, the professional stature and competence of the man selected for this assignment.

Unfortunately I do not have access to the data from which to construct an adequate picture of Leavitt's accomplishments during the 18 years of his tenure in Pittsburgh, such as the number of teachers under his direction when he took office in 1918, and the number when he relinquished control in 1936; the numbers of individuals served by the various schools and classes organized under his leadership; and other concrete achievements. I doubt that these details are necessary to my purpose, or that they would add appreciably to the picture I would portray. It is sufficient to say that it was a huge program; he was fortunate in his selection of capable assistants; it was a notable period in many ways.

A Timely Contribution

I turn back now to report somewhat more fully on what I think may properly be regarded as one of the major contributions of Leavitt's career, the publication of his first book.[4] The significance of this publication lies partly in the critical status of the period in which it appeared, the timeliness of its appearance, and the scholarly and professional competence of the treatment of the subject matter. For these reasons the book had a profound influence upon the development of the movement for industrial education.

It should be recalled that the earliest manual training schools were established in the late 1870's, and classes in cooking and sewing were first conducted under private control perhaps a decade earlier. Nevertheless, it has been estimated that by the opening of the century only a few more than 100 cities in the entire United States had introduced instruction in manual training and household arts in the public schools, and by no means all of these had installed complete citywide programs.

Further, not until the early years of this century were laws enacted providing for state aid or control, or both, for communities meeting certain requirements for the establishment of industrial schools (and/or other special types of schools and classes), to wit: Massachusetts, 1902, 1911; New Jersey, 1903, 1907; Ohio, 1909, 1910; Wisconsin, 1909, 1911; New York, 1910; Pennsylvania, 1911.

The National Society for the Promotion of Industrial Education was organized in November, 1906, and soon became a vital force in arousing public interest, and in directing public discussion, and in stimulating the enactment of legislation in several states. What we now know as the program of state and federally aided industrial and vocational education had its origin in the legislation noted above, and was further stimulated by the enactment of the federal Smith-Hughes law, in 1917.

At the time when Leavitt's book appeared, 1912, there was

[4] Frank M. Leavitt, *Examples of Industrial Education* (Boston: Ginn and Company, 1912), cloth, 330 pp.

widespread, if not actually nationwide, interest in and discussion of programs, policies, and problems relating to manual training, household arts, agricultural schools and classes, business schools and classes, industrial schools and classes, trade schools, part-time schools, continuation schools, evening schools, and others. Withal there was much confusion and misunderstanding. Much of the discussion was fruitless because the participants did not always know that they were not talking about the same things. Much of the terminology, many of the concepts, and most of the objectives were new and unfamiliar. Some of the advocates and supporters of programs were tactless in their approach, extravagant in their claims and assumptions, careless in their assembling and manipulation of data, and often inclined to confusion of principles with opinions and hopes.

A Source of Reliable Information

It is significant that Leavitt's book appeared just at this juncture, and for this reason met a need that was widely felt. The book, in short, supplied the answers to many pressing problems; it furnished the basic data upon which to proceed with the discussion of promising solutions. As suggested, the first distinguishing characteristic of the book was its timeliness, and this alone is sufficient to establish its status as a major contribution.

The second valuable feature of the book was the large volume of information assembled, well organized, and arranged in usable form. No one up to that time had attempted to bring together such quantities of data, from such widely separated sources. It was indeed a remarkable source book to become available at that early period. One of the helpful and suggestive features was a chapter on "State Legislation," which included analyses of the laws on the subjects under discussion that had been enacted in the 16 states which had taken action up to that time. A particularly valuable contribution to better understanding of the various plans and proposals that were being considered was a series of chapters describing and analyzing the objectives of typical schools: the prevocational school, the intermediate industrial school, the vocational high school, the trade school, the cooperative school, the continuation school, and vocational guidance.

The third distinctive feature of the book was a thorough and informative discussion of the significance of the movement for industrial education, the relation of manual training (as it was then called) to industrial education and to the broader and more inclusive field of vocational education, and the relation of all these to the concept of education as a complete and unified whole.

The fourth distinctive feature of the book was the outline of a plan, in Chapter VIII, for reorganizing the existing public school system of the typical urban community, and more especially the industrial community, for the purpose of including provision for certain newer types of schools and classes then being advocated. As one of the major objectives in any such reorganization, it was emphasized that the plans must be made "large enough to include the education of all the children in a given community." There must be an end to complacent acceptance of the inevitability of the elimination of large numbers of children from the schools. Repeated references were made to the reports of Ayres[5] and others who studied this problem. "As the result of investigations begun nearly a decade since, the attention of educators generally has been called to the fact that approximately 85 per cent of the children entering the public schools of the United States leave between the ages of 12 and 15, and that a large number of these have not completed the elementary school course." Much progress has been made, of course, in correcting and improving these conditions during the succeeding 40 years.

It was suggested that certain devices which had found acceptance in a few places would greatly improve conditions if more generally adopted, such as: smaller classes and more individual attention, shorter terms and more frequent promotions, promotion of pupils by subjects, and others. "At the end of the sixth year, and at intervals thereafter, provision should be made for differentiation of *purpose* as well as of method. . . . At the close of the sixth year those children who are *definitely planning* to leave school at the end of the eighth grade or earlier should be *permitted* but not *forced* to enter upon a course of study arranged with that fact clearly in mind." The double purpose in view was stated to be "to deter those who would, and to assist those who must, leave school at 14 or 15 years of age."

A further purpose was emphasized, namely, to impress young people with the value of further schooling, and to acquaint them with the significance of other opportunities available in addition to the traditional college-preparatory curriculum.

It is not necessary to examine the details of the plans outlined. The important point is that so constructive and so farsighted a plan could have been, and actually was, prepared at that early stage of development. Further, in the following pages, Chapter IX presented some "examples of more fundamental reorganization," by describing "the thoughtful experiments which are being inaugurated in school management" in nine selected cities in various sections of the country.

A loom in the textiles laboratory, State Teachers College, Oswego, N. Y.
— Photograph submitted by R. D. Helsby, industrial-arts instructor

[5] Leonard P. Ayres, *Laggards in Our Schools*, Charities Publication Committee, New York, 1909.

Industrial Arts and Vocational Education

John J. Metz, *Editor*

THE INDEX FOR VOLUME 40

The attention of our readers is called to the fact that the annual index for the current volume is stapled into the center of this issue so that it can be removed easily by those who want to bind the ten issues into a single volume.

It may be of interest to the readers that approximately 200 authors have contributed to the material that was published in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION in 1951. Among these authors there are classroom teachers, supervisors, directors, principals of schools, and men from industry. Among them, too, are men connected with the elementary, junior high, senior high, technical high, part-time and full-time vocational schools, teacher's colleges, and adult education programs.

Geographically, these authors come from states, cities, and communities located in practically every part of North America.

The editor takes this opportunity to thank these writers for contributing their valuable material for the good of those to whom is entrusted the important task of teaching the subjects of industrial arts and vocational education to our American youth.

ARE YOUR STUDENTS WORTH IT?

Are you taking the proper interest in your students' physical condition? Some of our readers may want to answer by saying, "That isn't my job — I'm a shop teacher." True, you are a shop teacher, but you also are a human being, and you are dealing with human beings whom you are to influence, guide, and train, so that they will grow up as useful members of the human family.

You have the 1951–52 members of your classes under your professional observation for several months. Some of them may come from families that are not greatly interested in their boys' physical and moral welfare. As a teacher, your personal interest in your boys, beyond the school phase of grades in studies and attention to work in the classroom, may mean the difference between a life that will be well spent, or one that will be a failure.

Just this morning (Wednesday, October 24) the *Milwaukee Sentinel* carried a story of a fourteen-year-old girl who skipped school to assist her mother in a bank robbery. The girl, when she attended school next day, presented a written excuse signed by her mother which read "Please excuse —— for being absent from school. She had a cold." The note was signed by the mother.

That poor teen-ager is getting training that will not prepare her for living a good, happy, cheerful life.

Probably an understanding teacher could sense that something was wrong from her contacts with the girl at school, or from efforts to discover what kind of home life the student had.

Then there are students whose health conditions ought to be attended to. At times the teacher can discover these, even though parents and the school health service have failed to note them.

The mother of a twenty-year-old boy recently told the writer that an induction examiner told her that her son was suffering from defective eyesight. This fact had evidently escaped both the family and the school nurse while he was attending school.

Defective hearing also often handicaps children, who, because of this oversight, go through life carrying a heavy burden which they might have been spared if some interested person had found out about it in time, and had done something about it.

Taking a little more interest in your students may mean burdening yourself with more worries and annoyances, but the satisfaction of smoothing out the physical, mental, and spiritual troubles of a fellow creature will far outweigh the extra time and effort that has to be put into each separate student.

MOTOR-VEHICLE INSPECTION

According to the Association of Casualty and Surety Companies, practically one third of all states are now demanding regular inspection of automotive equipment, such as lights, brakes, etc., as a highway safety measure.

It is estimated that in 1952 regular inspection will be given to more than 13,000,000 motor vehicles. Eventually this periodic inspection will be given to every vehicle in the United States. What this will mean in the prevention of traffic accidents can readily be seen. Deaths in automobile accidents in the twelve states requiring inspection last year were 14.7 per cent below the national average of 7.5 deaths per 100 million vehicle miles, as computed by the National Safety Council. In states not requiring these periodic inspections, fatalities were 4 per cent above the national average. In the inspection states, the death rate was 6.4 deaths per 100 million vehicle miles, against 7.8 in the noninspection states.

Would it not be a fine project for the school year 1951–52 if the school auto shops would prepare their students to make these inspections and then offer their service gratis to the automobile drivers of their community. It would mean that the school shop would have to be prepared to check the lights, brakes, steering gear, windshield wipers, mirrors, and, if that be thought advisable, the registration identification, of all who bring their cars to the school to avail themselves of this service.

Of course, to make this work really effective, it should be done in conjunction with the local police. It should also be done, in connection with the safe driving courses now given in many high schools, so that eventually we would have a fine body of young drivers who would not only know and practice the rules of the road, but who could also make the proper check-up on their own cars so that they are always in safe mechanical condition.

The automobile-inspection program idea was started when Governor Alfred E. Smith of New York proclaimed a "Save-A-Life" campaign in the fall of 1927. Pennsylvania followed with a similar campaign in the following year, and the movement, interrupted by two wars, has grown slowly ever since.

Our business in life is not to get ahead of others, but to get ahead of ourselves — to break our own records, to outstrip our yesterdays by our today, to do our work with more force than ever before.

— *Stewart B. Johnson*

Predicting Success in High School Industrial Courses[1]

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and
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The point of view that students should be selected on the basis of interest, aptitudes, physique, and other attributes before being admitted to industrial courses in vocational schools has won wide acceptance. Quite frequently it is overlooked that many high schools are offering trade and industrial courses, with vocational preparation rather than industrial-arts objectives as the aim. These courses often do not carry the federal subsidy as prescribed in the Smith-Hughes Law of 1917. In the interest of proper student development, and efficiency of instruction, there should be effective guidance and objective selective procedures for the placement of students in high school industrial courses.

The student enters an industrial course as often because of academic failure or rejection by a selective vocational school as he does because of a positive interest and aptitude for the instruction offered. It is not being forgotten that the modern public high school is committed to the policy of education for all who wish to attend. The problem of *low ability* students, of whom there are now many, cannot be solved merely by exclusion from curricula. There must be guidance, self-appraisal, and the provision of instruction designed to meet the particular needs of each individual.

The Overbrook High School in Philadelphia is comprehensive, with students in academic, commercial, industrial, and a scattering of other curricula. The student body approximates 3000, of whom 24 per cent are in industrial courses. The socio-economic status of the students represents a cross section of the city's population.

The school includes grades 10, 11, and 12, with each year divided into A and B semesters. A study was made of boys in the industrial auto and electric shop courses in grades 10B, 11B, 12B, and the graduating class of January, 1948. These two courses included 64 per cent of the total industrial enrollment which was distributed among seven courses.[2] The purpose of the study was to determine, if possible, objective scores and other data on the basis of which the possibility of success or failure in the industrial course could be forecast with some degree of confidence. The students numbered 225 individuals. For some items of the analysis the total was smaller because data were not available for all cases.

The senior high school shop marks were used as a basis for determining the comparative degree of success in the industrial courses. Although the dangers and weaknesses of this criterion had been set forth in many places, it seemed to be the best available for this study. Correlations[3] were made between senior high school shop marks and the following:

1. Junior high school shop marks
2. Philadelphia Verbal Ability Test (1939)
3. Junior high school reading test results (Philadelphia Junior Test in Reading, Grades 7–9, February, 1940)
4. Junior high school arithmetic fundamentals test (Philadelphia Diagnostic Test in Fundamentals of Arithmetic, Grades 7–9, September, 1946)
5. Minnesota Paper Form Board Test (New York: Psychological Corporation, 1934)
6. Senior high school English marks
7. Senior high school mathematics marks
8. Senior high school science marks
9. Two areas of greatest interest on Kuder Preference Test (Chicago: Science Research Associates, 1941)
10. School attendance

The system of grading used in the senior high school is as follows:

A. Excellent	90 to 100 per cent
B. Good	80 to 89 per cent
C. Fair	75 to 79 per cent
D. Passable	70 to 75 per cent
E. Not passable	60 to 69 per cent
F. Very Poor	Below 60 per cent

The shop instruction covers 10 three-quarter hour periods per week. It is distributed as follows: shop — 4 periods (0.3 units), theory — 2 periods (0.2 units), related shop — 2 periods (0.15 units), and related drawing — 2 periods (0.1 unit). A composite mark was computed by weighting and averaging the grades.

The junior high school shop instruction covers three different courses. They are metal, wood, and electricity. The average mark was found for the three courses. The

[1] From Master's thesis: "An Analysis of the Predictive Efficiency of Certain Test Scores and Grades in the Selection of High School Students for the Industrial Auto and Electric Shop Courses" by Mary A. Scheuhing, Temple University, 1948.

[2] The industrial courses are: auto, building drafting, building shop, electric, machine drafting, machine shop, mechanical arts.

[3] The coefficient of contingency was used for determining the correlations:

$$C = \sqrt{\frac{S-N}{S}}$$

scheme of marking used in junior high schools differed from that used in the senior high school. The junior high school grades were E — excellent, G — good, F — fair, P — poor, VP — very poor. It was necessary, therefore, to convert the junior high school grades into the senior high school pattern. This was done as follows:

Old scale	*New scale*
E	A
G	B
F	C or D
P	E
V P	F

Difficulty was encountered in determining whether to convert the old scale F to C or D on the new scale. This was met by converting the F to a D, excepting in cases where a student had more than 25 per cent of his other marks at G or better. In that event a grade of C was assigned.

The Findings

1. *Comparison Between Junior and Senior High School Shop Marks*

An average mark was found for the three junior high school shop courses (metal, wood, electricity). This grade was compared with the senior high school shop grade received by the student on his final report in January, 1948. Because of the small number of cases in the extreme groups, the A's and B's were combined, as were grades E and F.

Separate tabulations were made for 138 students in the auto course and 100 in the electric course. The contingency coefficient for the auto students was +.34, while that for the electricity course was +.21. The grades for the combined groups are shown in Table I. The correlation between the junior high school and senior high school shop marks for all 238 students was +.26.

TABLE 1. Comparison Between Junior and Senior High School Shop Marks

Junior high school shop marks	*Senior high school shop marks* A–B	C	D	E–F	Totals
A–B	28	48	54	7	137
C	9	21	36	5	71
D	3	7	14	2	26
E–F	0	1	1	2	4
Totals	40	77	105	16	238

The correlation, though positive, is unexpectedly low in comparison with other similar studies. It might be speculated that the assigned shop grades were not true indications of achievement, but there were no data going beyond the grades themselves.

2. *Comparison Between Philadelphia Verbal Ability Test Scores and Senior High School Shop Marks*

The Philadelphia Verbal Ability Test is a group written intelligence test developed by the Public School System of Philadelphia.

The intelligence quotients were converted into a nine-step scale of relative scores as shown in the following:

I.Q.	*Relative score*
135–150	5 +
127–134	5 —
119–126	4 +
111–118	4 —
103–110	3 +
95–102	3 —
87–94	2 +
79–86	2 —
70–78	1

The correlation between the shop marks and verbal ability test scores was +.19 for 137 industrial auto students, and +.28 for 97 electrical students. The combined correlation was +.21. The distribution of all the scores is shown in Table 2.

TABLE 2. Comparison Between Philadelphia Verbal Ability Test Scores and Senior High School Shop Marks

Senior high school shop marks	*Relative scores—P.V.A. test* 5–4	3	2–1	*Totals*
A–B	10	11	12	33
C	11	31	34	76
D	15	39	53	107
E–F	1	10	7	18
Totals	37	91	106	234

The low correlations are in agreement with studies made of vocational school shop success and intelligence-test scores. The Philadelphia Verbal Ability Test score has little value, therefore, in predicting shop success.

3. *Comparison Between Junior High School Reading Test Results and Senior High School Shop Marks*

Relative scores, similar to those used for the verbal ability test results, were obtained on the Philadelphia Junior Test in Reading and compared with the senior high school shop marks. The test determines the student's reading level. Unfortunately, scores could be obtained for a total of only 118 students. The correlation was +.32 for 77 auto students and +.35 for 41 electrical students. The combined correlation was +.27.

The coefficients indicate some degree of relation between the two sets of data, but the relation is not sufficiently high to permit the reading test score in itself to be an accurate predictor of shop success. The distribution of all the scores is shown in Table 3.

TABLE 3. Comparison Between Philadelphia Junior Test in Reading and Senior High School Shop Marks

Senior high school shop marks	*Relative scores — Reading test* 5–4	3	2–1	*Total*
A–B	2	13	7	22
C	5	19	12	36
D	5	17	30	52
E–F	0	5	3	8
Totals	12	54	52	118

4. *Comparison Between Junior High School Arithmetic Fundamentals Test Results and Senior High School Shop Marks*

The correlations for the 115 auto students and the 88 electrical students were respectively +.34 and +.25. The combined correlation for the 203 students was +.26. The distribution of all the scores is shown in Table 4.

TABLE 4. Comparison Between Philadelphia Arithmetic Fundamentals Test and Senior High School Shop Marks

Senior high school Shop marks	*Relative scores — Arithmetic test* 5–4	3	2–1	*Total*
A–B	5	13	16	34
C	7	24	27	58
D	10	21	66	97
E–F	0	2	12	14
Totals	22	60	121	203

The correlations for these sets of data are likewise too low to be particularly significant. In view of the fact that shop instruction in electricity is said to include a relatively high mathematics content, it is difficult to account for its correlation being lower than that between the arithmetic test scores and the auto shop grades.

5. *Comparison Between Minnesota Paper Form Board Test Results and Senior High School Shop Marks.*

Relative scores were developed for the raw scores of the students, and transcribed as shown in the following:

Raw score	*Rating*	*Relative score*
48–64	very low	5—, 5, 5+
39–47	low	4—, 4, 4+
28–38	average	3—, 3, 3+
19–27	high	2—, 2, 2+
6–18	very high	1—, 1, 1+

The relative scores were correlated with the senior high school shop marks. The correlation for 126 auto students was +.23, while that for the 98 electrical students was +.29. The correlation for the combined groups was +.20.

The scores for the combined groups are shown in Table 5.

TABLE 5. Comparison Between Minnesota Paper Form Board Test and Senior High School Shop Marks

Senior high school shop marks	*Relative scores — Minnesota Paper Form Board* 5–4	3	2–1	*Total*
A–B	6	14	14	34
C	11	26	32	59
D	10	40	55	105
E–F	0	3	13	16
Totals	27	83	114	224

The degree of correlation between the shop marks and the scores on the form board test is somewhat less than that obtained in other similar studies, but the results usually agree in finding the relation to be too low for significance.

6. *Comparison Between Senior High School English Marks and Senior High School Shop Marks.*

The correlation for 141 industrial auto students was +.34, and that for 89 electrical students was +.32. The correlation for the combined students (shown in Table 6) was +.25.

TABLE 6. Comparison Between Senior High School English Marks and Senior High School Shop Marks

Senior high school shop marks	*Senior high school English marks* A–B	C	D	E–F	*Total*
A–B	4	9	20	3	36
C	4	13	41	8	66
D	1	22	59	28	110
E–F	1	2	11	4	18
Totals	10	46	131	43	230

It is interesting to note that, of 18 students failing in shop, only four of these failed also in English. The median English grade for all the boys studied was D.

7. *Comparison Between Senior High School Mathematics Marks and Senior High School Shop Marks.*

The correlation for 133 industrial auto students was +.34; for 91 electrical students it was +.30. The correlation for the combined students was +.33. The distribution of the scores for the 224 pupils is shown in Table 7.

TABLE 7. Comparison Between Senior High School Mathematics Marks and Senior High School Shop Marks

Senior high school shop marks	*Senior high school Mathematics marks* A–B	C	D	E–F	*Total*
A–B	17	8	12	1	38
C	19	12	21	8	60
D	28	37	37	9	111
E–F	1	2	7	5	15
Totals	65	59	77	23	224

It will be seen from Table 7 that only one out of 38 students earning A or B in shop failed in mathematics, while 5 out of 15 boys failing in shop failed also in mathematics. The median grade in mathematics for all the students studied was C.

The mathematics offered to industrial students is termed *shop mathematics*, and the attempt is made to relate it to the work of the shop. This undoubtedly accounts for the slightly closer relationship existing between mathematics and shop.

8. *Comparison Between Senior High School Science Marks and Senior High School Shop Marks.*

The correlation between senior high shop marks and senior high science marks was +.31 for 89 industrial auto students and +.60 for 61 electrical students. The correlation for the combined groups of students was +.37. The distribution of the scores for the 150 students is shown in Table 8.

TABLE 8. Comparison Between Senior High School Science Marks and Senior High School Shop Marks

Senior high school shop marks	*Senior high school Science marks* A–B	C	D	E–F	*Total*
A–B	11	10	5	0	26
C	20	15	15	2	52
D	16	20	22	8	66
E–F	1	0	2	3	6
Totals	65	59	77	23	224

The high correlation between the shop and science grades for the electrical students may probably be explained by the fact that the science (applied chemistry and applied physics) is rather closely related to the work of the shop. The combined correlation of +.37 is one of the highest found for any of the factors studied. It would have been of value to have compared the junior high school science grades with senior high school shop success. Unfortunately there were too few data available to make this comparison possible.

9. *Comparison Between Kuder Preference Record Scores and Senior High School Shop Marks.*

The Kuder Preference Record[4] scores for 171 industrial pupils were examined for their possible bearing upon shop success. In analyzing the test scores, the two of the nine areas in which the student made his highest relative score (indicating greatest interest) was selected.

The mechanical field was the leading interest area for all of the groups, excepting those students obtaining shop grades of E and F, where the numbers were too small to be significant. (There were only 2 and 7 cases, respectively.) The interests of students, as measured on the Kuder Preference Record, shows little relation, therefore, with shop success.

10. *Comparison Between Attendance Record and Shop Marks.*

Previous research has shown that the relation between regularity of attendance and shop success is relatively high. This is not surprising, inasmuch as irregular attendance inevitably interferes seriously with achievement. The relation between shop success and regularity of attendance is shown in Table 10.

TABLE 10. Comparison Between Attendance Record and Senior High School Shop Marks*

Senior high school shop marks	*Number of sessions present* 59 or less	60–64	65–69	70–74	75–79	80–84	85–89	*Total*
A					1	3	2	6
B					3	10	27	40
C				2	6	19	41	68
D	1		1	8	10	36	54	110
E	2	1		1		4	2	10
F		2		1	1	1	2	7
Totals	3	3	1	12	21	73	128	241

[4]Kuder Preference Record (Chicago, Ill.: Science Research Associates, 1941).

*Eighty-nine Sessions constitute perfect attendance for term September, 1947–January, 1948.

It will be seen that there is a tendency for the students earning the higher grades to have somewhat better records of attendance. The distribution does not warrant any very definite assumption, however.

Conclusions

The correlations between shop success (as measured by teachers' grades) and other data were all disappointingly low insofar as their significance is concerned for purposes of predicting shop success.

There are several inferences, however, which might be drawn from the study. The system of grading might be examined critically, in order to determine whether grades are true indicators of achievement. In one part of the thesis, not reported here, shop teachers were asked to select arbitrarily their 50 best and 50 poorest students. It was found that the grades which they actually received varied considerably from this arbitrary estimate of their ability. Evidently many diverse factors enter into the assignment of grades.

There might be carried out, with considerable profit, a careful interview and more adequate guidance in order to determine the individual pupil's interest and readiness for the industrial course of his choice. The previous background of the students should be broadened in order to enable them better to explore and learn their interests and aptitudes.

Further experimentation with some of the newer mechanical aptitude tests might be attempted, despite the disappointing results to date in this field.

Under existing conditions, the need seems immediate for exploratory and tryout activities in the senior high school shops, as a result of which the student may shift as soon as possible into a program meeting his real needs, aptitudes, and interests. This would call for great flexibility in the instructional program, especially during the first year.

For students not academically or mechanically inclined, suitable provision by other in-school or schoolwork programs need to be developed. This presents a problem that is not easy of solution, but represents an approach which should not be overlooked.

The Life Adjustment Program and Vocational Education

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Since 1918 America, in trying to universalize secondary education, has been concerned with improving the effectiveness of high schools as institutions for facilitating the efforts of all youth to make satisfactory adjustment to life consistent with democratic ideals. For evidence one can review the work of many national groups that have been interested in determining the place of the high school in American life.[1] In 1937 the Committee on the Orientation of Secondary Education published a report on the functions of secondary education. Among the ten functions discussed were (1) "to satisfy the important immediate and probable future needs of students," and (2) "to explore higher and increasingly specialized interests, aptitudes, and capacities of students, looking toward the direction of them into avenues of study and work for which they have manifested peculiar fitness."[2]

Directed by Frances T. Spaulding, New York State conducted a study to determine to what extent the state high schools are serving the needs of youth. The results of the survey, known as the Regent's Inquiry and published in 1938, revealed that youth graduating from the high schools in New York State were not able to take their places in society as citizens capable of effecting solutions to their problems and to those of society.[3]

In 1944 the Educational Policies Commission published a document titled "Education for All American Youth" which was widely read in educational circles and was studied as basis for reorganizing high school programs. The commission, advocating education for all youth, supported the idea that secondary education should take into account the differences and similarities of individuals and provide for them educational services geared to their personal needs.[4]

In spite of the work of the national groups just cited and of others interested in universalizing secondary education so that youth will be better fitted to cope with their daily problems, studies show that a large segment of high school youth are not being served effectively. Being sensitive to this gap between America's educational ideal and reality, Charles Prosser presented what has developed to be an historic resolution in his summarization of the 1945 conference on "Vocational Education and the Years Ahead." The resolution reads as follows:[5]

[1] Harold Spears, *The High School for Today* (New York: American Company, 1950), p. 25.

[2] *Ibid.*, p. 26.

[3] *Ibid.*, p. 27.

[4] Educational Policies Commission, *Education for All American Youth* (Washington, D. C.: National Education Association and the American Association of School Administrators, 1944).

[5] U. S. Office of Education, *Life Adjustment Education for Every Youth* (Washington, D. C.: U. S. Government Printing Office, 1947), p. 15.

"It is the belief of this conference that, with the aid of this report in final form, the vocational school of a community will be able better to prepare 20 per cent of youth of secondary school age for entrance upon desirable skilled occupations; and that the high school will continue to prepare another 20 per cent for entrance to college. We do not believe that the remaining 60 per cent of our youth of secondary school age will receive the life adjustment training they need and to which they are entitled as American citizens — unless and until the administrators of public education with the assistance of the vocational education leaders formulate a similar program for this group.

"We therefore request the U. S. Commissioner of Education and the Assistant Commissioner for Vocational Education to call at some early date a conference or a series of regional conferences between an equal number of representatives of general and vocational education — to consider this problem and to take such initial steps as may be found advisable for its solution."

Responding to the Prosser resolution which has been far reaching in influence, John Studebaker, as Commissioner of Education, appointed a commission on Life Adjustment Education for Youth which sponsored a series of conferences concerned with studying and effecting a solution to the problem posed by Prosser.[6] Growing out of these conferences were proposals for Life Adjustment Education, the philosophy of which is:[7]

"Life adjustment education is designed to equip all American youth to live democratically with satisfaction to themselves and profit to society as home members, workers, and citizens. It is concerned especially with a sizable proportion of youth of high school age (both in school and out) whose objectives are less well served by our schools than the objectives of preparation for either a skilled occupation or higher education. Some leaders have for years been at work in secondary schools developing a guiding philosophy and bringing about program reorganization in the direction of life adjustment education for every youth. Under such leadership, many high schools have made considerable progress in building programs of study and providing educational services basically useful to each participating pupil."

It is very likely that the program of Life Adjustment Education as proposed by the commission on life adjustment and other interested groups will have tremendous influence on every aspect of education for individuals of high school age. For already, throughout the country, guiding principles of the program have been studied in state and national educational meetings as basis for program reorganization.

The discussion on the implications of Life Adjustment Education for vocational education will be presented in terms of the basic underlying principles of the Life Adjustment Program as described in literature prepared by the Commission on Life Adjustment Education.

Co-operation Between General and Vocational Education

For too long the idea has been endorsed by many in various educational circles that there is a sharp distinction between general and vocational education and that the high school's major function is that of preparing students for college with emphasis on time-honored courses. Consequently, in the past, the exponents of vocational education made little effort to understand the values of general education and, conversely, the exponents of general education failed to critically question their views on the relationship of general education and vocational education. This contributed to the perpetuation of a dualism in secondary education in that general and vocational education were kept separate with more prestige being bestowed on the programs concerned with preparing youth for college.

In recent years, however, increasingly the theory that vocational and general education are necessary complements of a complete educational program is being widely accepted. It is being realized, as Spears puts it, "Vocational education and general education must function side by side in the program of every high school student if the realities of life are respected in school planning and operation."[8] Accepting this point of view Prosser requested in his resolution that the Commissioner of Education and Assistant Commissioner for Vocational Education call a conference or a series of regional conferences consisting of an equal number of representatives of general and vocational education to consider the problem of life adjustment training for the 60 percenters.[9] That the request was sound is seen in the following statements commenting on the value of the five regional conferences on Life Adjustment Education:[10]

"The regional conferences served their purpose well. It was the fine ground-work laid at these conferences which made possible the considerable accomplishments of the National Conferences. Incidentally they proved beyond all question that those who have been pri-

[6] *Ibid.*, Part I.
[7] U. S. Office of Education, *Developing Life Adjustment Education in a Local School*, Circular No. 253, p. 3.
[8] Spears, *op. cit.*, p. 96.
[9] U. S. Office of Education, *Life Adjustment Education for Every Youth*, p. 15.
[10] *Ibid.*, p. 17.

Arts and crafts products made by students of the Tucson Senior High School, Tucson, Ariz. Submitted by Harry A. Goldstein, instructor of photography

— Photograph by Ken Kemmeries

marily engaged in vocational education and those whose work has been largely in the field of general secondary education can work together in harmony and can make outstandingly significant contributions by joint endeavor."

Thus it can be concluded that the movement toward life adjustment education suggests that the exponents of vocational education and of general education should religiously try to facilitate the closing of the gap between general and vocational education by developing an appreciation for the importance and relation of general and vocational education in a complete educational program for an individual. Life adjustment is impossible unless the individual is capable of coping with problems related to citizenship and family living. Too, life adjustment is impossible when the individual is not occupationally adjusted.[11]

Functional Education for All Youth

In America, it is believed that secondary education should be the common schooling of all youth. Statistics show that though progress has been made, this educational ideal has not been realized.[12] According to a statement made by John Studebaker when he was Commissioner of Education, 30 per cent of youth do not begin high school and 30 per cent more do not complete the work begun.[13]

Why is it that the high school is not able to attract and hold more youth? In the Maryland Study it was revealed that the following factors help to reduce the holding power of secondary schools: (1) economic status of the family, (2) intellectual ability, (3) interest, and (4) value placed on education.[14]

The fact that mental ability is a selective factor in school attendance and that many students drop out of school because school programs are not meaningful to them no doubt led Prosser to conclude that 60 per cent of youth of high school age are not receiving the life adjustment education they need. Hence, the life adjustment education is concerned with serving those 60 percenters whose objectives are not being served.

It is obvious that the needs of 60 percenters will not be served unless the secondary education programs are oriented to their needs, of which occupational adjustment is one.[15]

Surveys show that over half of youth in America will engage in semiskilled jobs. The 60 percenters perform a variety of jobs of which many involve operating machines. If vocational education is going to contribute to the efforts of America to serve the needs of what is referred to as the educationally neglected youth, it must progressively provide training opportunities for semiskilled jobs. This is particularly true in view of the increase in semiskilled jobs due to technological developments.

Course Content and the Problems of Living

If it is agreed that an individual's existence is one of constant problem solving in an effort to live a satisfactory life, it follows that one is adjusted to the extent that he is able to cope with his daily problems. Moreover, an educational program is meaningful for a student when it is related to his needs and problems. In a life adjustment education program the needs and persistent problems of living are centers of emphasis as indicated in the following statement:[16]

"Learning experiences required of all are selected and planned for inclusion in Life Adjustment Education Programs in terms of common recurring problems rather than restricted to college entrance requirements or other specialized needs of the relatively few."

Implementation of an educational program in terms of the above philosophy necessitates a constant study and, subsequently, constant reorganization of the educational program. The exponents of vocational education have long advocated that a vocational education program should be consistent with labor demands. But more than ever before, as the tempo of industrial changes accelerates, it will be practically impossible to plan and execute a functional vocational education program without periodic review of labor demands and job requirements. As the Prosser resolution implies, vocational education programs have primarily been concerned with serving the 20 per cent of youth interested in pursuing skilled jobs. But the philosophy of the life adjustment education suggests that a study of job requirements should include semiskilled and some unskilled jobs as well as skilled jobs.

Emphasis on Direct Experience

Due to industrialization and much-needed child labor laws, youth today are cheated of the opportunity to receive work experience. In the past youth helped their parents farm, build houses, and perform other socially essential jobs. That youth today do not have similar opportunities contributes to what Kallen[17] identifies as "prolongation of infancy" and necessitates an educational program that recognizes the need for desirable work experience for youth.

The life adjustment education movement advocates including work experience as part of all youth's educational program. As this point of view gains support, there will be less tendency for parents, students, and the public in general to belittle work. The abandonment of the idea that only the time-honored courses are educational will enable vocational education programs to extend the scope of co-operative training and to receive progressively enthusiastic support of the public.

Program Adjusted to Individual Needs and Abilities

It has been the common practice in many schools to refer slow learners to vocational shops to be taught how to use their hands. Such practices ignore the interests, abilities, and aptitudes of students. Moreover, such practices are based on the false assumption that a student who experiences difficulty in learning the so-called "academic courses" would be successful in activities requiring mechanical aptitude. Evidence seems to indicate, however, that universal acceptance of the adjustment education philosophy will decrease the tendency for administrators to automatically refer slow learners to vocational shops. Through an effective guidance program, a continuous effort will be made to discover the unique characteristics of each student — his needs, interests, abilities, and aptitudes — for the purpose of planning for him an educational program that will facilitate his living a satisfactory life as a homemaker, citizen, and worker.

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[11] *Ibid.*, p. 97.

[12] William Alexander and J. Glen Saylor, Secondary Education, *Basic Principles and Practices* (New York, Rinehart & Company), pp. 236–238.

[13] U. S. Office of Education, *Life Education for All Youth*, p. iii.

[14] Howard Bell, *Youth Tell Their Story* (Washington, American Council on Education, 1938), Chap. III.

[15] U. S. Office of Education, *Developing Life Adjustment Education in a Local School*, Circular No. 253, p. 3.

[16] U. S. Office of Education, *Work Conference on Life Adjustment Education* (Washington, D. C., 1948), p. 10.

[17] H. M. Kallen, *The Education of Free Men* (New York: Farrar, Straus and Co., 1949), Chap. V.

Need for Better Qualified Teachers

A program of life adjustment education requires teachers who are capable of providing instruction that is meaningful to all youth to the end that they are able to cope with the recurring problems of living.

The Prosser resolution, advocating that a Life Adjustment Education program be a joint undertaking of the exponents of general education and vocational education, suggests that a vocational program should be staffed with teachers:

1. Who have a good general education;
2. Who show evidence of possessing the desire for continuous professional growth by participating in professional affairs, maintaining a professional library, and engaging in further study;
3. Who are technically competent;
4. Who have had industrial work experience;
5. Who have an understanding of the learning process;
6. Who are sensitive to the similarities and differences of students.

In summarizing, life adjustment education, concerned with providing for all youth a program orientated to the personal and social needs of all youth so that they will enjoy satisfactory lives as home members, as workers, and as citizens, suggests the following:

1. The exponents of vocational education should critically evaluate their concepts of the relation of vocational education and general education as basis for facilitating the closing of the existing gap between these two complementary aspects of a complete educational program.
2. Vocational education increasingly should provide training opportunities for semi-skilled jobs as well as for skilled jobs.
3. Vocational education programs must make provisions for periodic review of industrial needs and job opportunities.
4. Vocational education programs, in view of the changing nature of industry and of the need for making instruction meaningful for students, should place more emphasis on co-operative training.
5. Vocational education programs must be staffed with teachers who are sensitive to the similarities and differences of youth and who are capable of adjusting instruction to these differences and similarities.

PROBLEMS AND PROJECTS

TEACHING AID FOR DRAFTING CLASSES

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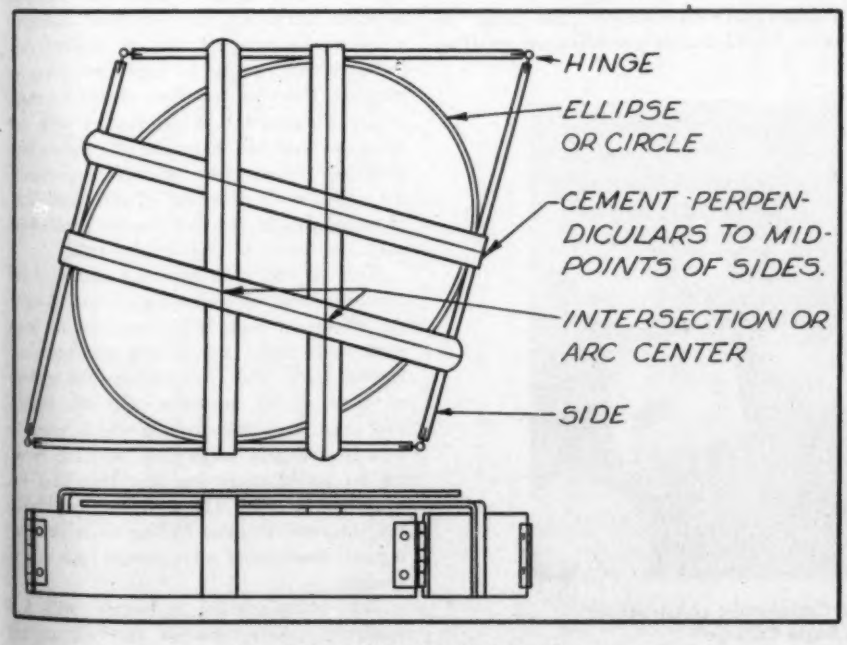
This teaching aid was designed for a demonstration of the four-center method of drawing an ellipse, while studying "Methods of Teaching Drafting" under H. P. Skamser at Michigan State College.

This aid enables the student to understand the principles rather than trying to memorize an abstract construction of lines on paper. He is able to see the perpendiculars, which intersect at one point in the circle, move out to four intersection points as an elliptical form is developed. At the same time they maintain their perpendicular relationship to their respective sides.

This model was constructed of plastic. The circle is made of plastic 1/32 in. thick. The perpendiculars are 1/16 in. thick, and the sides are 1/8 in. thick. The widths of the various pieces can be arbitrarily decided on. The ends of the sidepieces were split with a hacksaw to receive brass hinges. They were fastened in place with DuPont Cement. The plastic could be cut and drilled to form its own hinges. The heavy intersecting lines are scratched on the plastic and then filled with black wax crayon.

A person demonstrating this aid before a class should wear a plain white shirt. White makes a good background and enables the class to see the black intersecting lines much more clearly.



Teaching aid for the drafting class

MINIMALIC CONSTRUCTION — A METHOD OF TEACHING BUILDING CONSTRUCTION

WILLIAM A. BAKAMIS
Graduate Student, Bradley University on leave from Washington State College

Part I

One of the most fundamental impulses governing all human activity is the urge to create — the desire to make things. Though it has long been recognized as a force that vitalizes all works of art, it has been relatively recent that its educational values have been recognized. There are two possible

reasons for this: (1) No phase of human activity is less susceptible to changes of any type than education, (2) Our system of education is at the mercy of current cults and customs.

It naturally follows that the introduction of a new course or new subject into the school curriculum must be based on traditional grounds or be a remedy for the ineffectiveness of the present system. This latter reason is the basis for the introduction of *Minimalic Construction* as a method of teaching building construction.

The failure of the average child or adult to display any discriminative feeling or taste in the selection of everyday things has been emphasized more and more in recent publications. This has been especially true in the construction and the buying of homes. One thing is certain, the imagination displayed in infancy by many individuals has not been maintained.

Children dramatize situations and create a world of excited pleasure for themselves. They have a strong imagination and enrich many things with a vivid fancy. It is characteristic of young children to utilize every available object, such as chairs, boxes, tin cans, and the like in the creation of a particular setting in which they can experience the thrills of things in which they delight. To them a wooden block becomes a car, an airplane, a ship, or an electric range. As the child grows, this age of make-believe demands a more accurate representation. Children combine their impulse to build with their still intense imagination in the creation of things that will satisfy their immediate desires. The commercial toy or doll has only a passing pleasure for them. The child's imagination and effort in making something he desires is of far more value to him than any ready-made thing that he may possess. It is important that the schools take cognizance of the child's precious imagination and creativeness and employ methods that will provide continued expression and give semblance to his animated fancies.

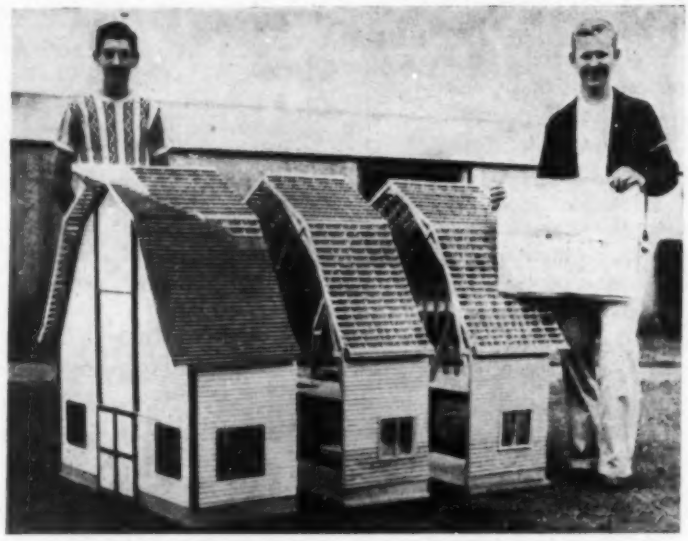


Fig. 2. Agriculturally minded youngsters construct farm buildings of all types, such as this sectional barn

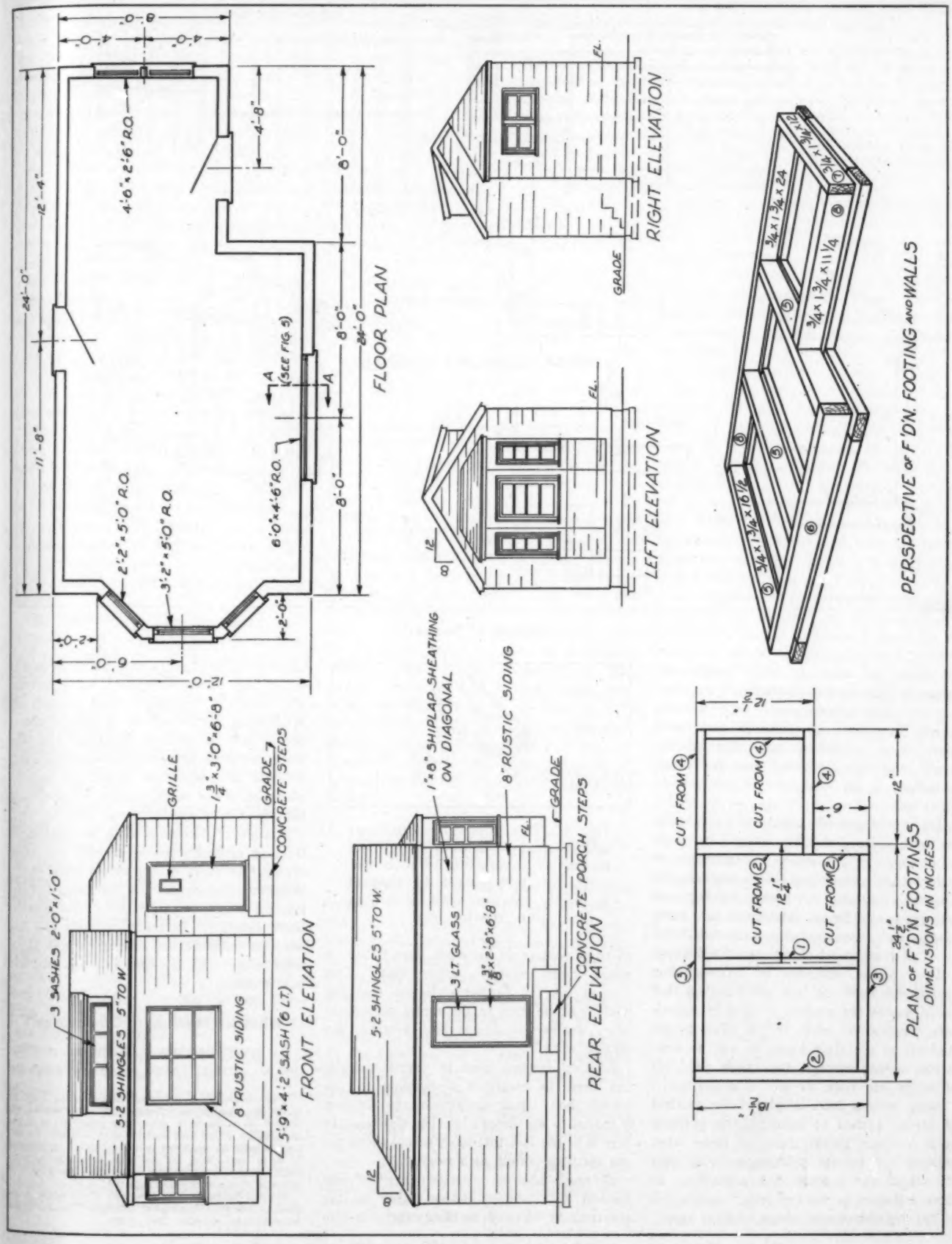
Almost everything the child sees and handles is three dimensional. Yet, many schools still use drawing and painting as the sole means of having children express themselves. The author does not suggest that drawing and painting are not important. They become important and of value to the student if they are complementary to a scheme for practical work that gives the individual child an opportunity to construct the things he desires. Model making and miniature construction have received attention from many educators as a possible remedy to the shortcomings of the present curriculum. It is becoming more and more apparent to most educators that work of this type promotes interest in many subjects, which would otherwise be beyond the individual pupil's experience.

Miniature construction and model making introduce the student to a wide variety of materials and processes, yet the tools and equipment needed for this work are relatively inexpensive. Furthermore, the nature of the work is such, that it continually demands originality and ingenuity from each student. Because individuals vary in their interests, it cannot be expected that all students will be attracted equally to any one form of material. However, an effort should be made to get students to get experiences with one or more types of materials of construction. Miniature construction provides opportunity not only for the discovery of the possibilities of materials, but also the creative possibilities that are latent in the child himself.

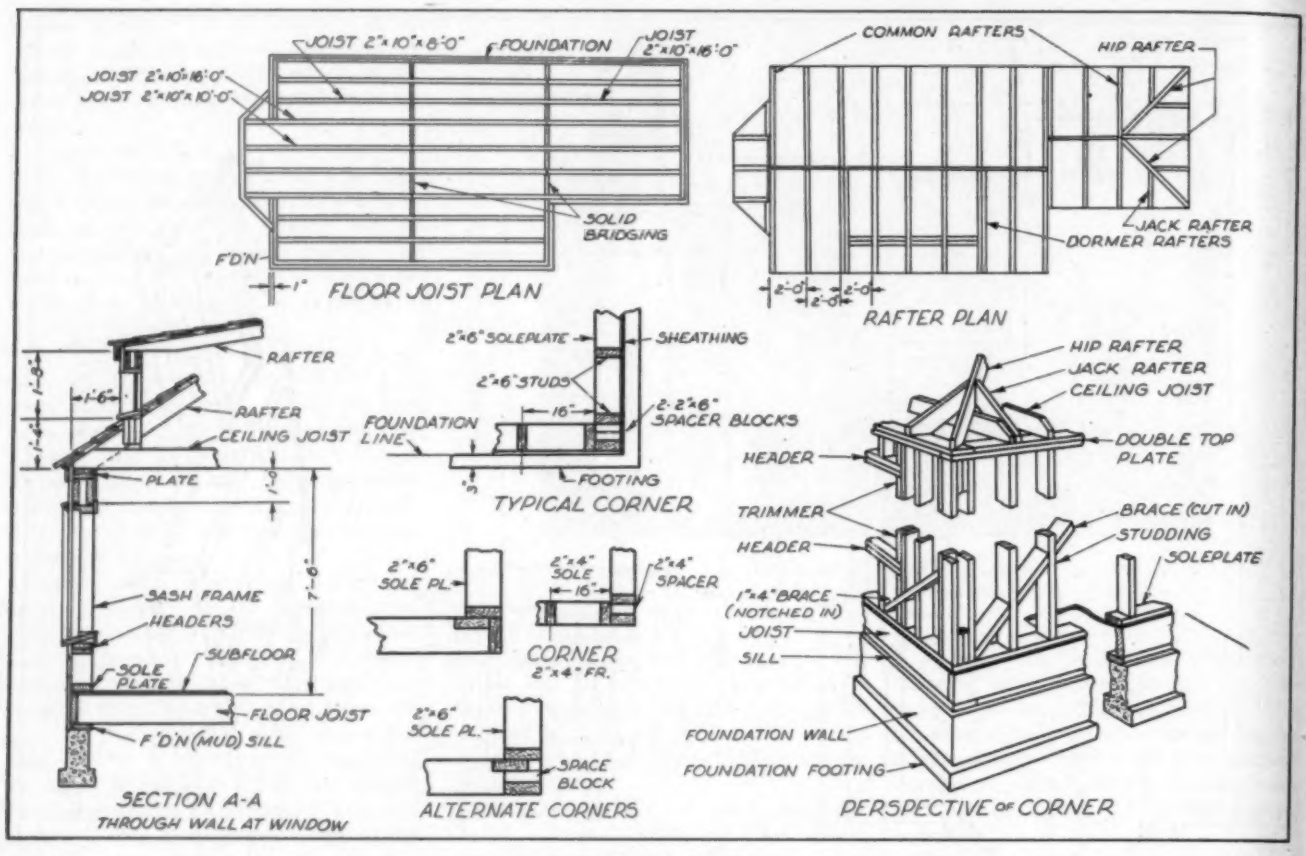
Work of this type does not end with the commencement of junior high school. During the adolescent years it is important for such work to be continued in more and more advanced form. This will include the making of model yachts, airplanes, railroads, houses, and other high-class toys in which scientific data is of utmost importance. Students working on scaled miniatures find that they become *real* to them. The more real and lifelike they become the more *leading on* or developmental possibilities are opened up to the student.

The industrial-arts instructor will find miniature construction an excellent method

Fig. 1. Introductory course in "minimalic construction" at North Montana State College



Plans and elevation of house to be constructed



Details of house

to enrich the work in home building or carpentry courses. The leadership in acquainting the future homeowner with pleasing design, economy in planning, and good construction of homes has fallen on the school, and it is important that instructors know how to use miniatures to aid them in their work.

The importance of a course in home building and home ownership cannot be overemphasized. It is receiving the attention of many school administrators throughout the country. Courses in home building, or carpentry are being introduced in many schools and, when properly presented, fulfill many of the general objectives of education.

The greatest difficulty in home-building courses has been the lack of a method that would enable the student to actually experience construction work. In the effort to get students to use their hands as well as their minds, several systems have been tried, all of which are open to serious objections.

Some schools have employed the method of having a class of industrial-arts students build a house, garage, barn, or some other building for private individuals living near the school and desiring such a building. In most instances persons desiring construction of any building would prefer to have experienced carpenters do the work, even though it would mean slightly higher costs. This method has the further objection that the work must be done in the spring or autumn when weather conditions are favorable for outside work.

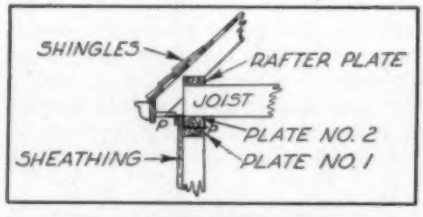


Fig. 4. This diagram illustrates one method of framing, which will make it possible to remove the roof. This will permit the student to apply interior wall coverings and interior trim

Another method used in several schools has been to construct a building in the school shop. Upon completion, the building is moved to the owner's lot. The disadvantage here is in the fact that most school shops are too small to permit such work.

It must also be stressed that, in any method that utilizes student labor in the construction of any building, there is the threat of having trouble with the trade unions. Again, and almost invariably, many instructors using the foregoing similar methods are overlooking the objectives of general education as well as those of industrial arts. The work described is becoming vocational, and it must be emphasized again that general education in the public schools is not directly concerned with specific trade training.

Minimalic construction as a method of teaching carpentry has been tried and tested for over 18 years. It has solved many of the problems confronting the industrial-arts instructor whose responsibility it has been to teach carpentry. In the paragraphs that follow, the industrial-arts instructor will find a brief history and description of this relatively new method.

What Is "Minimalic[1] Construction"?

As stated by Aubol,[2] minimalic construction is a term: "employed to designate the

[1]The derivation of the word *minimalic*, as stated by O. G. Hughson is as follows: "the word *minimal* was selected since the work being done resembles, or is like the smallest of its kind and therefore *minimal*. By adding the suffix *ic*, signifying in the nature of, or pertaining to, as in formic acid, the new noun or substantive 'minimalic' defines more or less accurately the purpose or objective of the work being done."

[2]Quentin Seldon Aubol, *Minimalic Construction in the Oregon Schools* (Unpublished Master's Thesis), Oregon State College, Corvalis, Ore., 1947.

(Note: After removing index, treat pages 400 and 405 as consecutive pages.)

use of such scaled miniatures in the teaching of the fundamental construction processes in the building of residences, farm buildings, and other structures, for consumer and general education values rather than for specific vocational values." Minimalic construction can therefore be considered a *method*. The method involves the construction of miniature buildings from lumber cut to scale. Blueprints for such buildings include as many of the construction features as it is possible for the student to complete in the time allotted. Figure 1 shows students completing the introductory unit in minimalic construction.

The question often arises as to the difference between models, miniatures, and *minimalic construction*. Generally, a model is considered as the reproduction of a building using any materials that will lend themselves to the verisimilitude, or it may be a pattern to follow in true construction. From the construction of a model the student can learn but few, if any, of the principles governing actual construction. Were there time, a student might profit by working out a model of a building and then constructing the building itself, or he may erect a selected building and later reproduce it in model form. These methods, because of the time element and for the reasons stated in foregoing paragraphs, cannot be used effectively in most schools.

The miniature, on the other hand, is a reproduction of a building to scale. It must be a true reproduction of the original in all details, including materials and construction. Their use in the school shop is limited because of the time factor. Minimalic construction in its advanced phases comes closer to representing a true miniature. Figure 2 illustrates what can be done in the advanced phases of the work.

The minimalic construction method was devised for the junior and senior high school pupil. It was devised with a view of what the average student might reasonably be expected to accomplish in the time periods allotted and at the same time understand the principles involved in building construction. To attempt much more than this means the calling of older students, more time, the sacrifice of other studies, or "slap dab" work. Where there is a fast worker, blueprints may be altered in such a manner that more features are added.

The minimalic construction outline herewith presented contemplates the construction of buildings in miniature as a practical means of vitalizing the instruction and applying the informational content. When properly presented, minimalic construction will focus the attention of the student on trends in housing design, on construction methods, and on the utilization of building materials. The program should lead to increased *building consciousness* and a consideration of the following *consumer values*.[3]

1. Appreciation of the value and limitations of wood as a construction material.
2. Appreciation of construction methods appropriate to the building requirements under consideration.
3. Acquaintance with materials and terminology used in plans, specifications, and building construction.
4. Appreciation of *good* construction; ability to detect poor construction, either in purchasing a home or in supervising the construction of a new one.
5. Acquaintance with the general procedure of home planning, financing, construction, and maintenance.

The Use of Miniatures in Teaching

Though the practice of constructing scaled miniatures dates back to the early Egyptians, the system of teaching full size construction through their use is relatively recent. The use of these scaled miniatures for the purpose of teaching full-size construction was first reported used in 1916 by the late Ira S. Griffith, then head of the industrial-arts department at the University of Missouri. On the staff at that time was Professor George B. Cox, now head of the industrial-arts department at Oregon State College. Cox was so influenced by the success of Griffith's use of miniatures in teaching carpentry that in the period 1920 to 1927 he introduced similar courses at the University of Wisconsin. The scale used in constructing these miniatures was 1½ in. to the foot. In 1928 Cox introduced the teaching of carpentry through the use of miniatures into the curriculum at Oregon State College with E. E. Meyers serving as first instructor of the course.[4]

The Origin and Use of Minimalic Construction in Teaching

The origin of minimalic construction dates back to 1933 when O. G. Hughson, upon his retirement, turned to helping boys through the unstable period of adolescence. By establishing *Boy Builder Clubs* under the sponsorship of the state 4-H Clubs the boy builder program gained such impetus that it attracted the attention of administrators in both the elementary and secondary schools in Oregon. In the eight-year period from 1933 to 1941, over 1600 boys had been organized into 34 Boy Builder Clubs.

The interest and enthusiasm in minimalic construction was probably best expressed by S. L. Godard, former Lorane High School (Oregon) principal when he said:

> Such a hold has this building construction project taken on the boys of the school and on me, there seems to be nothing to take its place. It's a unique work that means more to and for the boys than words can express. It has vitalized our community, because it supplies an incentive for the boys and provides them with the opportunity to exhibit their craftsmanship in competition with others.[5]

To carry on this extensive program, Hughson had to secure financial assistance. This he obtained from the lumber industry, retail lumberyards, building supply dealers, and many of the lumbermen's associations. These nonprofit and nonadvertising groups have contributed large sums of money and material (waste lumber) for the purpose of furthering the program. At present there are over 35 groups supporting the minimalic construction program. They have joined forces and have acquired the name *State Building Congress*, which is headed by O. G. Hughson. This Congress is, as Hughson points out, "the neutral body through which the contributions of industry may reach the school." It must be emphasized that the *Congress* does not have a voice in the program. It may contribute money or material or both, but cannot advertise products or designate how the scrap lumber will be used.

In 1940, the committee on the state course of study for industrial arts in Oregon, with Professor Cox as chairman, developed a course of study for carpentry and building construction. Since the course recommended the use of scaled miniatures, O. G. Hughson saw the opportunity to foster minimalic construction as regular, curricular work in the schools rather than as builder clubs. During the school year 1942–43 through the co-operation of Rex Puttman, state superintendent of schools in Oregon. Professor Cox, and O. G. Hughson, minimalic construction was introduced into the Oregon schools as part of the industrial-arts curriculum. The program developed so rapidly that at the present time over 189 schools in 21 states and two provinces in Canada offer minimalic construction as a part of the industrial-arts curriculum. States offering this work include:[6]

State	*No. of Schools*
Oregon	111
Washington	28
Montana	7
California	7
New York	6
Idaho	6
Pennsylvania	3
Louisiana	3
Indiana	2
Kansas	2
Nebraska	1
North Carolina	1

[3]State Department of Education. (Oregon) *Carpentry and Building Construction;* A Supplement to the State Course of Study in Industrial Arts. State Printing Department, 1941, p. 5.
[4]Quentin Seldon Aubol, *op. cit.*, pp. 10–11.
[5]*Op. cit.*, p. 13.
[6]State Building Congress Report of 1947.

State	*No. of Schools*
Utah	1
Arizona	1
Maryland	1
Ohio	1
Maine	1
West Virginia	1
Oklahoma	1
North Dakota	1
Wisconsin	1
Canada	3
Total	189

Four teacher training institutions now offer courses in minimalic construction. Oregon State College has continued to offer this work since 1942. In 1947 the State College of Washington at Pullman, Wash., introduced a similar program. Shortly thereafter, North Montana State College included minimalic construction in the industrial-arts curriculum. The fourth teacher training institution to offer work of this type was Bradley University. In each of these institutions students are taught the techniques of teaching carpentry through the use of the minimalic construction method. *Demonstrators* are also constructed by these future teachers for later use in the teaching of building construction.

Part II

The outline which follows is not intended to serve as a course of study for carpentry. Furthermore, the industrial-arts instructor who has not had experience or training in the techniques of building construction will find the information presented of little value. The information is intended as a general guide for the qualified industrial-arts instructor who may wish to conduct regularly organized carpentry classes in the junior or senior high school. It may also be of value to civic-minded building contractors and leaders in the building trades who may have a desire to conduct boy builder clubs as a part of the civic activity program for boys. Advisers of 4-H clubs, Boy Scouts, the Y.M.C.A., and other groups may find this material helpful in promoting similar programs.

Essential Tools

The tools used in minimalic building construction are relatively inexpensive. You will note that several of the tools are common to other activities in the shop. Some of these tools can be made by students. The amount of tools used in this work will depend on the initiative and ingenuity of the instructor. A description of the tools used in minimalic building construction follows. A suggested list of tools for a class of 24 students is also presented. Instructors planning to introduce this work into their present program may find this list of some assistance.

No. 1. Rafter square; body 24 by 2 in.; tongue 16 by 1½ in. This square should have the rafter table, brace measure table, board measure table, and the octagon scale on it. Students will use it for obtaining the necessary data in computing the lengths and cuts of rafters, braces, and other layout work. Instructors should make certain that the rafter tables appear on the square.

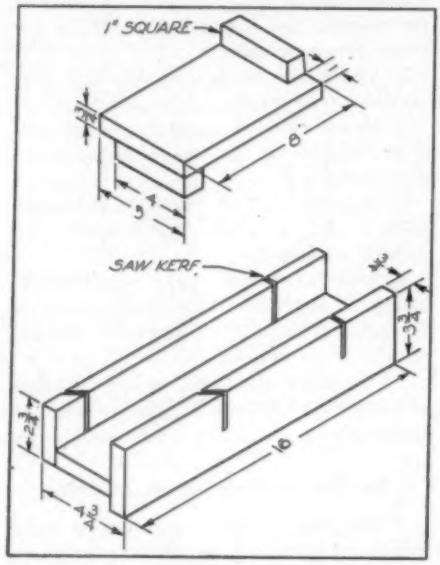


Fig. 3. Bench hook and miter box

No. 2. Junior steel square; 8 by 12 in. — to facilitate construction work to scale, this square should be graduated in eighths. It is used to measure straight line marking, and other general layout work, including rafters.

No. 3. Pencil — for marking in layout work.

No. 4. Tack hammer, 5 oz. magnetized, or upholsterer's hammer, 7 oz. magnetized; used to drive nails. The small magnetic head permits their use in tight places. Claw hammers of a lighter type may be used if the others are not available.

No. 5. Long-nose pliers — used for tight, cramped work; can be used for setting in cross-bridging and similar work.

No. 6. Backsaw, 11 point or dovetail saw — used to cut scaled material to proper lengths and widths. It is also used with the miter box in making miter cuts.

No. 7. Crosscut saw, 28 in., 10 point — used to cut larger pieces of scaled lumber, such as footings, foundation walls, etc. It is also used for the construction of special jigs and fixtures that call for full size lumber.

No. 8. Socket chisel, 3-in. blade, ¾ by 3 in. — used for trimming rafters, braces, and other fine work.

No. 9. Block plane — used for "backing" hip rafters and for other similar work.

No. 10. Jackknife — used in layout work where accurate measurements are required. It can also be used to replace the chisel and the plane when these are not available.

No. 11. Rule, 12 in., or architect's scale — the rule should be graduated in eighths. Both are used for measuring.

No. 12. Bench hook — used for holding stock while sawing. This may be made by the student at the start of the course. Figure 7 illustrates the construction of the bench hook.

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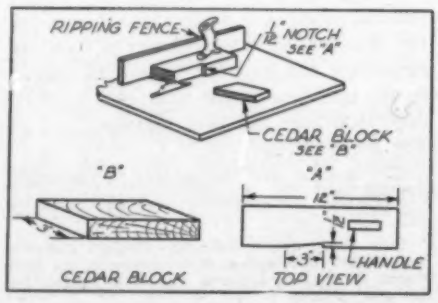

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Many instructors have, however, improvised squares, rules, etc., from sheet copper, brass, aluminum, tin, and other metals.

Scale

It has been found that the scale of 1½ in. to the ft. is most appropriate for use in the school shops. This means that any building constructed will be one eighth the full size.

There are three reasons why the scale of 1½ in. to the ft. was chosen: (1) the economy in the use of materials; (2) a building built on this scale could be constructed within the limits of the industrial-arts shop; and (3) scaled *lumber* used in the construction is not so small that it will present constructional difficulties.

Instructors can make the work more realistic by having students refer to all members by the proper or technical names used in the trade. A piece measuring ¼ by ¾ in. would be called a *two-by-six* and one measuring ¼ by ½ in. would be a *two-by-four*. Joists, studs, plates, etc., should be referred to by their trade name as *two-by-fours* and *two-by-sixes* rather than by the actual dimensions in miniature.

Nails

All fastenings should be made in the same manner as on a full size building. Glue should not be used. Nails of a size proportional to the scale should be used. One half inch 19 or 20 gauge wire nails are suitable for most of the framing. Five-eighths in. No. 19 gauge, or ¾-in. No. 18 gauge wire nails are best suited for "spiking" together joists, headers, and other larger members. The ½-in. nails can also be used for nailing shingles.

Lumber: Basswood, redwood, yellow poplar, and pine of the softer varieties have been used with success in various sections throughout the country. Douglas fir and similar woods can be used for larger members, such as foundation walls and footings. Western red cedar has a tendency to split. It must be emphasized that when selecting material for minimalic construction work, select only the type that does not split readily.

The *lumber* for the construction of these miniatures can be sawed from mill ends and *shorts*, or from other low cost materials. Lumber mills are usually willing to co-operate with the schools and will generally offer *waste material* for carrying on work of this type. Some instructors have utilized crates, apple boxes, and salvaged lumber to obtain the miniature lumber desired.

Most shops are equipped with a table saw, jointer or planer to manufacture this miniature lumber. In localities where lumber is scarce, instructors may write to the State Building Congress, Henry Building, Portland, Ore., for assistance in securing suitable materials at a minimum cost. Several eastern schools have obtained *waste lumber* by simply paying the freight charges from West Coast sawmills. One school in New York obtained three carloads of this waste lumber by paying the comparatively low freight charges.

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Blueprints for the introductory course may be obtained from the State Building Congress. Instructors may develop their own plans if they so desire. Depending upon the time available, students may utilize drawings actually prepared by an architect or other qualified designer. Work experiences should be as real as possible and every effort should be made by the instructor to obtain drawings that will bring about such experiences for the pupils.

If time permits, students may draw up their own plans and later on construct the building in miniature. This method is used quite extensively by many instructors. Through a close co-operation between the drawing teacher and the shop instructor pupils can gain many worth-while experiences.

Foundations

It is customary for miniature buildings to be erected on portable platforms of appropriate size. The foundation layouts are laid out on the platform in a manner similar to the plan used in laying out a foundation plan on a lot. It is, however, difficult to get two methods to correspond exactly, but the instructor can successfully inform the pupils on foundation layouts, the use of batter boards, chalkline, stakes, etc. Field trips will supplement this instruction very effectively.

Instructors have approximated foundation problems by constructing miniature forms and by pouring foundation walls in much the same manner as would be done in actual construction work. In cases of this type, plaster of Paris has been used rather than concrete. It is recommended that the construction of miniature forms and the pouring of foundation walls be limited to special cases.

Removable Roofs

In the advanced phases of minimalic construction it is often necessary to remove the roof in order that the interior wall coverings and the interior trim can be applied. In such a case, the pupil must make a departure from full scale construction methods. It will be noted in Figure 4 that Plate No. 1 is nailed solidly to the studding. Plate No. 2 is nailed to the ceiling joists. The sheathing covers the crack where the roof lifts off the top plate, indicated by line *PP*. An arrangement of this type will permit the removal of the roof section after the exterior of the building has been completed. Interior wall surfaces may then be covered with thin plywood or heavy cardboard. Wood trim, miniature cabinets, and other fittings can be installed depending on the time available and the ingenuity of the student and the instructor.

Miniature Shingles

Shingles are usually made from the flat grain of red cedar blocks ¾ to 1½ in. in thickness. The jig shown in Figure 5 is used with a circular saw in cutting these *scaled* shingles. The blocks from which the shingles are cut are cut 2½ in. long from boards of any convenient width — usually 6 to 12 in. One end is placed in the notch *A* and the cut is made by pushing the complete jig forward, with the saw traveling as close to the jig as possible. After each cut the block is turned over and another cut is made from the same end. If the throat of the circular saw has sufficient clearance, the shingles will drop through into the sawdust chute and can be easily collected. If the throat does not have the necessary clearance the shingles will remain on the table.

Correlating Work With Other School Subjects

Minimalic construction has unlimited possibilities in correlating the work with other school subjects. It has been used very effectively in the *unit type* program. Students working on an *all-class project* may pursue both the construction project and at the same time fulfill the mathematics requirement for the unit by figuring all material bills. Science students, especially those in physics and biology could profit by a study of electricity and sanitary services for the home while they are constructing the building. Home-economics classes can put into practice decorative theory by planning and carrying out the interior decoration in as complete detail as they desire. In much the same manner other school groups could participate in the project, depending, of course, on the time and ingenuity invested in the project.

Experience With Full Size Materials

Even though the objectives of the work are not vocational, many instructors provide opportunity for their pupils to experience a limited amount of full size construction. Pupils are given the opportunity to frame a full-size rafter. Hip, valley, and jack rafters may be framed in much the same manner. Depending on the time available, instructors may have students construct other selected members and sections of typical building details, such as cornices, corners, sills, window frames, etc. L. M. Roehl's book, *Problems in Carpentry*, will give the instructor further suggestions on the construction of full size sections.

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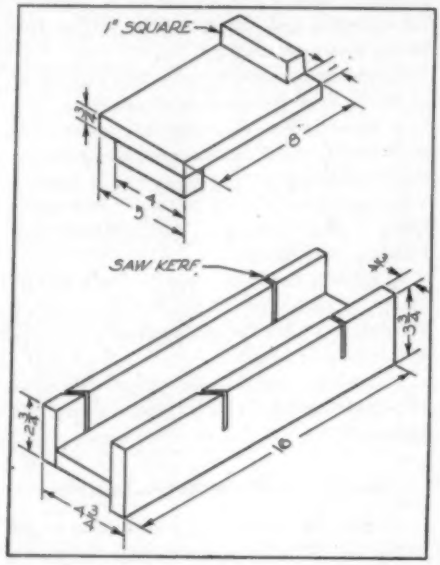

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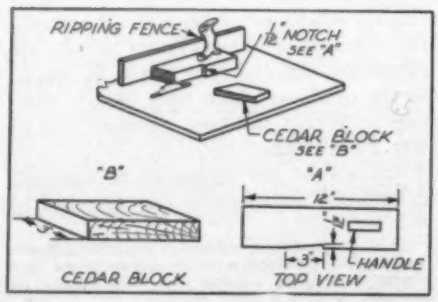

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In the advanced phases of minimalic construction it is often necessary to remove the roof in order that the interior wall coverings and the interior trim can be applied. In such a case, the pupil must make a departure from full scale construction methods. It will be noted in Figure 4 that Plate No. 1 is nailed solidly to the studding. Plate No. 2 is nailed to the ceiling joists. The sheathing covers the crack where the roof lifts off the top plate, indicated by line *PP*. An arrangement of this type will permit the removal of the roof section after the exterior of the building has been completed. Interior wall surfaces may then be covered with thin plywood or heavy cardboard. Wood trim, miniature cabinets, and other fittings can be installed depending on the time available and the ingenuity of the student and the instructor.

Miniature Shingles

Shingles are usually made from the flat grain of red cedar blocks ¾ to 1½ in. in thickness. The jig shown in Figure 5 is used with a circular saw in cutting these *scaled* shingles. The blocks from which the shingles are cut are cut 2½ in. long from boards of any convenient width — usually 6 to 12 in. One end is placed in the notch *A* and the cut is made by pushing the complete jig forward, with the saw traveling as close to the jig as possible. After each cut the block is turned over and another cut is made from the same end. If the throat of the circular saw has sufficient clearance, the shingles will drop through into the sawdust chute and can be easily collected. If the throat does not have the necessary clearance the shingles will remain on the table.

Correlating Work With Other School Subjects

Minimalic construction has unlimited possibilities in correlating the work with other school subjects. It has been used very effectively in the *unit type* program. Students working on an *all-class project* may pursue both the construction project and at the same time fulfill the mathematics requirement for the unit by figuring all material bills. Science students, especially those in physics and biology could profit by a study of electricity and sanitary services for the home while they are constructing the building. Home-economics classes can put into practice decorative theory by planning and carrying out the interior decoration in as complete detail as they desire. In much the same manner other school groups could participate in the project, depending, of course, on the time and ingenuity invested in the project.

Experience With Full Size Materials

Even though the objectives of the work are not vocational, many instructors provide opportunity for their pupils to experience a limited amount of full size construction. Pupils are given the opportunity to frame a full-size rafter. Hip, valley, and jack rafters may be framed in much the same manner. Depending on the time available, instructors may have students construct other selected members and sections of typical building details, such as cornices, corners, sills, window frames, etc. L. M. Roehl's book, *Problems in Carpentry*, will give the instructor further suggestions on the construction of full size sections.

Units of Instruction

It is not necessary to include an outline of what should be presented in a course in minimalic construction. The content in such an outline would be similar to any course in general carpentry. The literature in this field is almost exhaustless, and the instructor will find many courses of study that he can use very successfully in this type of work. A bibliography, though not complete, is presented at the end of this article, and should give the instructor some assistance in developing his own units of instruction.

Conclusion

This article has been presented as an appeal for a wider use of *minimalic construction* and as a practical contribution toward the imaginative, yet constructive craftsmanship that should form an important part of every child's education. Second, it has been presented in an effort to supply some useful information to the industrial-arts instructor and to all those interested in honest craftsmanship. And finally, it is intended that the material presented will eventually focus the attention of young people on trends in housing design, on construction methods, and on the proper utilization of building materials. It is hoped that those interested in honestly developing the creative and imaginative powers in children will seriously consider the *minimalic construction* method of teaching building construction.

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A PRODUCTION JOB FOR KOREA

G. VALENTINE

7th & 8th Grade General Shop

North Bellmore School

North Bellmore, L. I., N. Y.

Occasionally, in our shop, time is devoted to current event discussions concerning related subjects in industrial equipment and events in new mass-production methods and practices. Most prominent among the discussions would be latest military equipment being shipped to Korea. Here the nucleus for our idea began to develop, being supplemented at the time with a strong plea by the American Red Cross to aid our fighting soldiers in Korea with parcels containing writing paper, food packages, etc. Our shop students decided that they wanted to send something different, something that would be a most useful package to a soldier in a country like Korea.

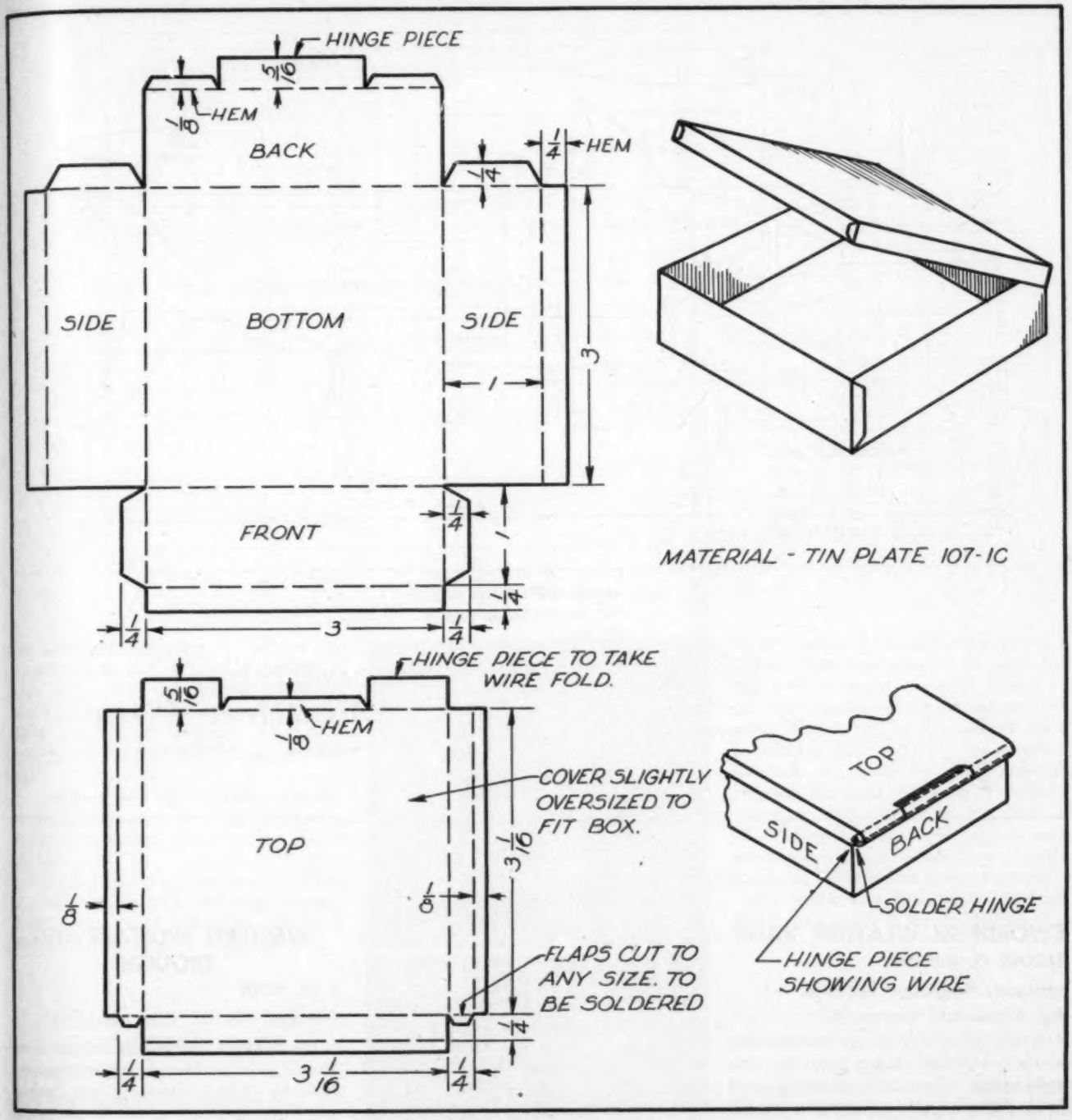
After careful deliberation, with several mass meetings among the shop classes, we decided that our project would be in the form of individual packages that could be carried easily by a foot soldier — a package that he would not wish to discard. In this he could carry all his personal items. The general idea was that this package was to be sent directly to the front lines and to be used by soldiers who had to remain there for weeks at a time. These were just the preliminary stages in the planning of the package that was to be sent.

When the plan for helping soldiers was presented to the principal, it was accepted with such enthusiasm that he himself joined our staff. A survey was soon made of our faculty veterans who served in the China-Burma theater during World War II. With the aid of the faculty veterans, our package began to take shape as to what its purpose and objective would be and the proper size that this box should be in order to serve its purpose best. Finally a general meeting was held to determine the final draft of the package. It was decided that it would be made of metal (tin plate), small enough and strong enough to be packed and carried by a foot soldier at the front lines. This box was to be 3 in. square, and no deeper than 1¼ in., including the cover. The students wanted the soldier to feel that this box, which held small comforts unattainable in the front lines, was important to him. The problem arose as to what essential items were to be placed in this box. The solution of this problem was in forming a committee to interview home-coming Korean veterans of the community. It was through their fine cooperation, patience, and time that we actually learned what our box should contain, and it gave verification as to the proper size it should be without hindering the necessary equipment a soldier had to carry about.

From among the articles wanted by the *front-line* G.I.'s, we chose the following, since they had been overlooked in the larger issues of war.

1. pencil
2. pad
3. aspirin
4. Scotch tape
5. string
6. clips and tacks
7. toothpicks
8. razor blades (single and double)
9. needles
10. pocketknife
11. buttons
12. chalk
13. gum
14. shoelaces (2 pairs)
15. Band-Aids

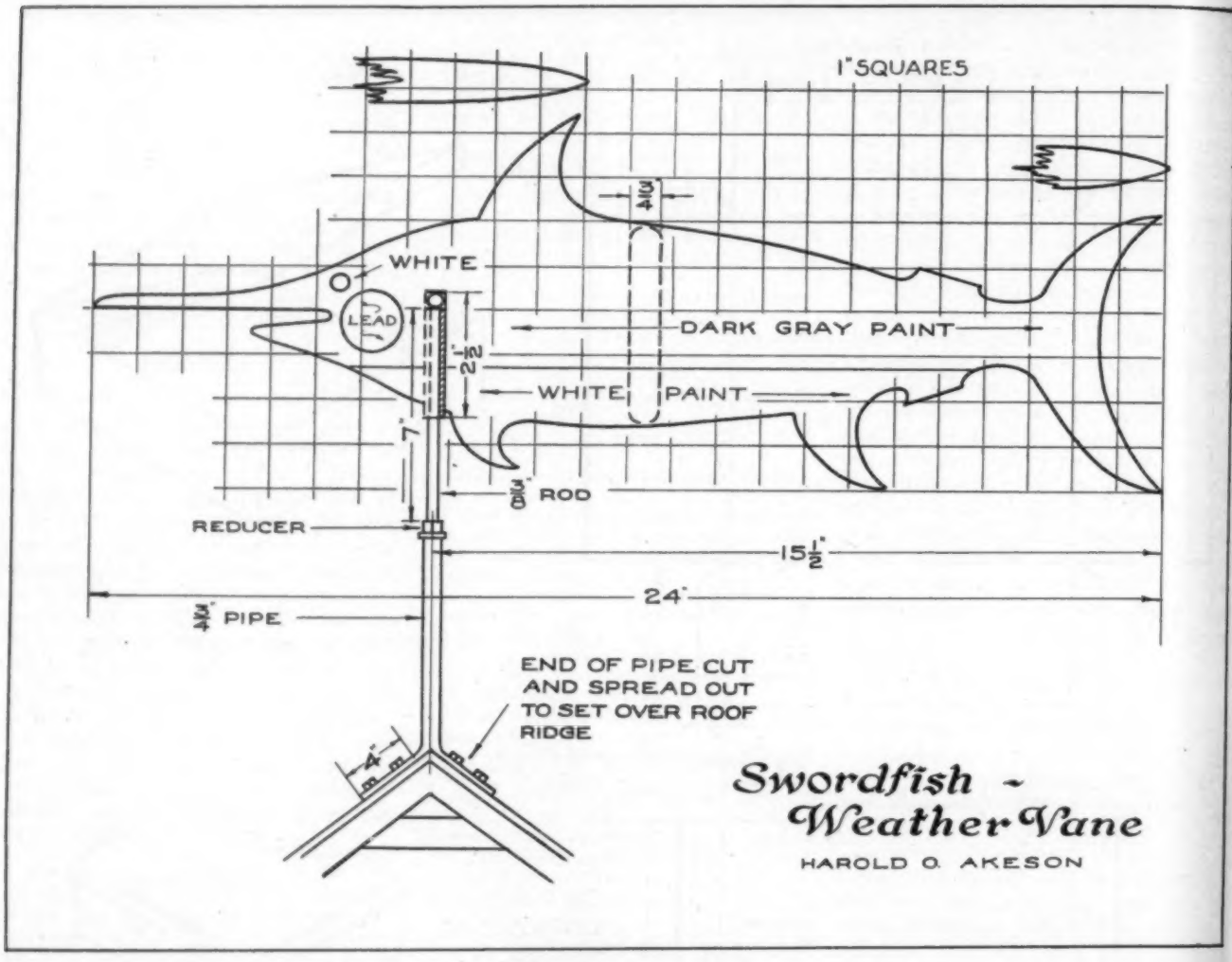
After scrutinizing the contents of the box, our student public relations committee and members of the faculty decided to name it the *G.I. Gimmick Box* due to the nature of the articles. Soon circulars and posters describing our idea concerning the box and the articles found their way throughout the school and community. The response for donating articles was tremendous. The idea of our box was so well accepted that a model box was made and shown to give our public a



G.I. gimmick box for Korea

much better picture of the gimmick box. Finally our production crew went into operation and turned out 100 boxes for our G.I. boys. They were fully packed and wrapped in a waterproof carton for shipment overseas. In order to assure ourselves that the package would be sent by the fastest method, the services of Col. Hollidge, commander of the Mitchell Field Air Force Base, were cheerfully donated to the project. A special courier was sent to our school to pick up the parcel, which in turn was placed aboard an Air Force C-54 transport plane, for shipment to Korea.

As a climax to this project, we have in return received letters from many areas in the Korean front, from soldiers representing various fighting units. A great deal of time and effort was devoted to the preparation and carrying out of this program. However, it is believed that the time and energy was well spent in the education of the students and in bringing the community into closer contact with our industrial-arts program. This is especially true since we feel that the project was motivated by a spirit of service to a very worthy cause.



Swordfish weather vane

SWORDFISH WEATHER VANE

HAROLD O. AKESON
Instructor, Mechanical Drawing
High School, East Orange, N. J.

Weather vanes may always be considered in style especially today with the new rambling-type house and attached garage that is definitely suited for a weather vane at the front end. This particular vane is one that is common on homes along the shore, but its design could be changed to some other motive to suit other environments and locations.

Weather vanes are usually made of metal, but this one is designed to be made of wood. White cedar, poplar, pine, or even ¾-in. waterproof (resin-bonded) plywood may be used.

First, the pattern of the fish is laid out on paper with pencil, using 1-in. squares, as a guide for making outline of the shape. When the paper drawing is completed, cut out and trace onto the selected wood, and then cut it out with a scroll saw.

For counterbalance, bore a 2-in. hole in the head of the swordfish, as shown on the drawing, to receive a lead weight.

On the edge, at the head of the fish, drill a hole at right angles, for brass tubing to take a ⅜-in. brass rod. At the top place a steel ball for the rod to swivel upon. The other end is threaded to fit a reducer which in turn is fitted to a ¾-in. pipe. The ¾-in. pipe, 12 in. long, is split 4 in. from one end with a hack saw. Shape this split end to fit over the ridge of the roof. Drill the feet for ¼-in. lag screws.

Assemble the pieces, and pack the bearing with grease to insure easy turning for a long time.

All parts should be painted to the colors shown. Use black for the metal parts.

WESTERN FRUIT-SERVING TROUGH

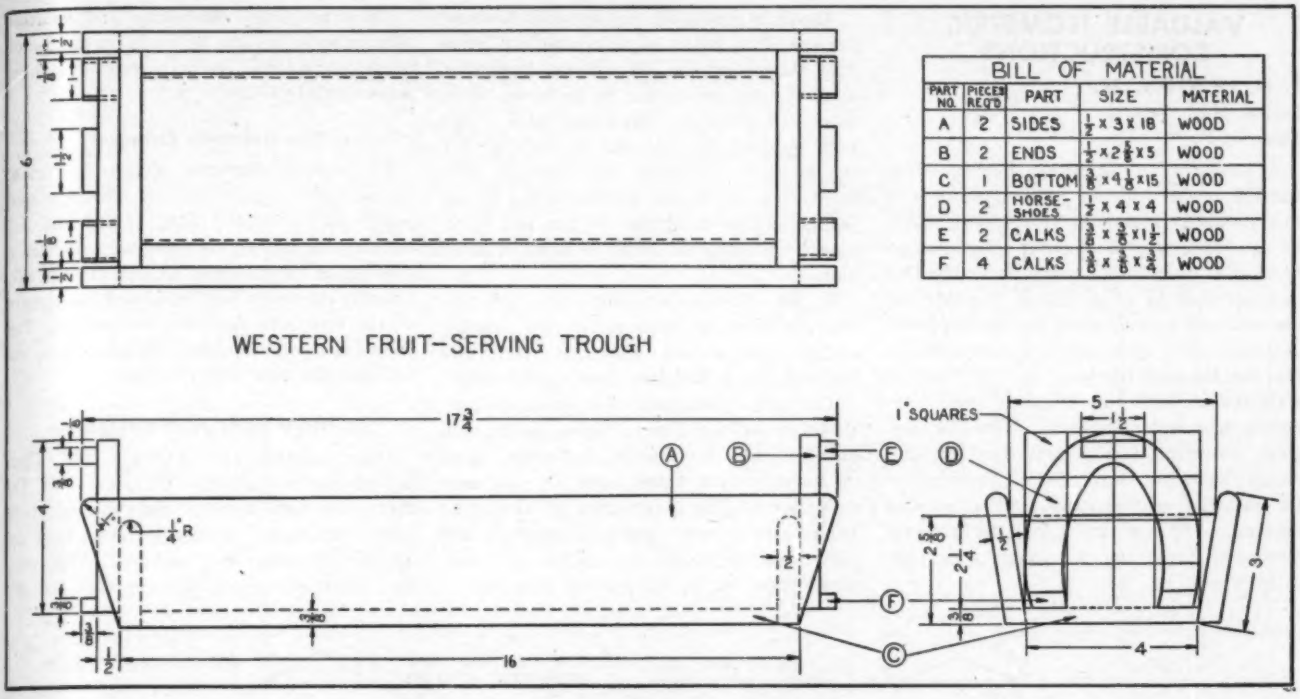
I. M. FENN
Chicago, Ill.

The Western fruit-serving trough shown here is different. Mothers will welcome this attractive holder and server of fruit. Students will enjoy constructing this simple project for their homes. The trough may be made of wood or plastics, whichever is chosen.

Directions: Square the two sides to the dimensions, and then shape them as shown.

Square the two ends and bottom piece.

Make a layout for the two horseshoes. Trace the pattern on the wood and cut out both pieces at one time. Prepare a strip for all calks to complete the horseshoes. Cut the six calks from this strip. Sandpaper all parts of the horseshoes and attach the calks with glue and brads. Suggestion is to stain


WESTERN FRUIT-SERVING TROUGH
BILL OF MATERIAL
PART NO. | PIECES REQ'D | PART | SIZE | MATERIAL
A | 2 | SIDES | 1/2 x 3 x 18 | WOOD
B | 2 | ENDS | 1/2 x 2 5/8 x 5 | WOOD
C | 1 | BOTTOM | 3/8 x 4 1/8 x 15 | WOOD
D | 2 | HORSE-SHOES | 1/2 x 4 x 4 | WOOD
E | 2 | CALKS | 3/8 x 3/8 x 1 1/2 | WOOD
F | 4 | CALKS | 3/8 x 3/8 x 3/4 | WOOD
17 3/4
16
4
1" SQUARES
5
1 1/2
3
2
2 1/4
1/2
1/4" R
A
B
C
D
E
F

Details of fruit-serving trough

the horseshoes and leave the rest of the trough natural with a coat of lacquer or white shellac. For purposes of contrast, if this is desired, stain the horseshoe handles before attaching to the trough. After sandpapering all parts of the trough, assemble with glue and nails.

Experiences: Reading a drawing, planning, layout, squaring, crosscut sawing, ripsaw work, sanding, assembling, gluing, nailing, finishing, etc.

Projects of this nature will tend to inculcate in students the desire to give gifts, naturally inspiring them to do a good job, one which they will not be ashamed to present.

VISUAL AIDS FOR THE AUTOMOTIVE SHOP

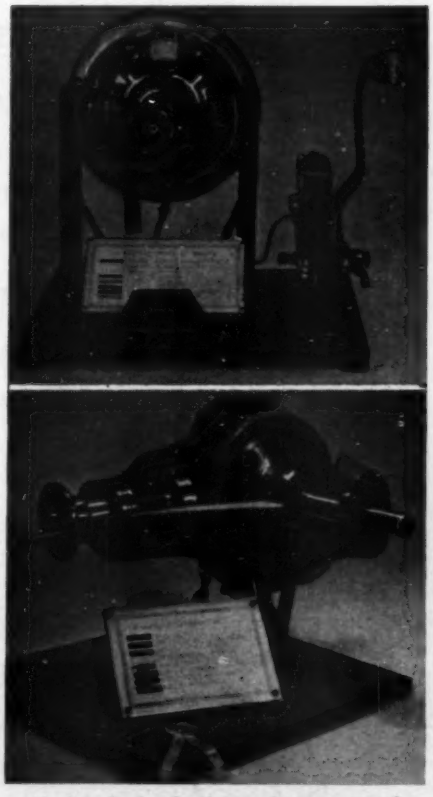
EDWARD McILHENNY

Port Washington Public Schools

Port Washington, N. Y.

During our most recent Industrial Education Exposition at Hofstra College, Hempstead, N. Y., four of the boys from the Port Washington Senior High School received special awards for their outstanding work while participating in the automotive mechanics class. Their projects were the only exhibits representing the automotive field in industrial arts. Thaddeus Kuczinski and Victor Schultz completed the hydraulic brake demonstration shown herewith. Percy Donley and Andrew Mosby completed the differential cutaway as shown. These boys removed all parts from cars given to us for our shop, cleaned and cut away all parts, and reassembled them with each individual part color coded and labeled for teaching purposes. One of the features of the brake unit is the use of the stop light switch to illuminate the names of the parts. These two units are now being used in the school system for instructional purposes in the automotive shop and by the driver education classes for both full-time students and adults.

The photographs were made by David McLane, a member of the Photography Club.



Hydraulic brake (upper) constructed by Thaddeus Kuczinski and Victor Schultz; (lower) constructed by Percy Donley and Andrew Mosby

— Photo by David McLane

The Travelers Insurance Companies, Hartford, Conn., report that almost 500,000 casualties in 1950 were the direct result of speeding. One out of every three Americans who lost their lives in last year's wrecks met death because someone was driving too fast.

Speed has been causing a greater percentage of accidents year after year. In 1950, speed was a greater factor in traffic casualties than at any time in history.

Traffic laws and law enforcement are part of the answer. Engineering will help some. But with perfect roads and perfect police work, the man behind the wheel can still continue to exceed the speed limit if he wants to or if he isn't thinking.

VALUABLE ISOMETRIC CONSTRUCTIONS

F. N. NEWTON, JR.
Senior High School
Sharon, Pa.

A knowledge of isometric drawing is invaluable to the workman in the shop for with this knowledge and a pencil and steel square he can make a good pictorial representation of most of the objects he has to make. This pictorial drawing often makes it easier for the mechanic to understand his job. Isometric also has a great advantage over perspective in that an isometric drawing can be made to scale and accurately dimensioned, which cannot be done with perspective. With the foregoing statement it is evident then that isometric embodies two types of drawings — the pictorial representation and a working drawing of the same object with the necessary dimensions given and the proper scale indicated.

The main reason for this article is to stress the use of isometric in ways that are never read about, and, in the writer's experience, ways that do not appear in textbooks. It is hard to understand why these have never been included in textbooks in drawing, for the examples are such that they are very usable in many ways. The hexagonal shapes especially have many uses in practical work, such as on hexagonal shapes of heads of bolts, nuts, etc.

In our advanced drawing classes we also find the following explanations very valuable and it is the writer's belief that others who read this article will find them equally useful.

The two illustrations, one on house construction and the other a piping layout, will also be found to be usable, and when drawn on isometric co-ordinate paper are very easy to construct. The construction of block-type letters also becomes simple in isometric and very often the woodshop is called on to construct letters of the alphabet for signs, etc.

There are many interesting and valuable constructions that can be made by the use of isometric pictorial drawing once a student acquires a knowledge of it.

The Isometric Octagon

To draw an isometric octagon first draw the isometric axes *AC* and *BR*. Through these points draw isometric lines, as 1–4 and 2–3 to form the square. On these same isometric axes lay off the distances *aA*, *bB*, *cC*, and *dD*. Connect the joints just found and the corners of the square to complete the octagon. The distances mentioned above are taken from the orthographic view with dividers.

To Draw an Isometric Hexagon

Draw isometric axes *A'C'* and *B'D'*. Then lay off lengths *O'A*, *O'B'*, *O'C'*, and *O'D'*. On these axes draw isometric lines through these points parallel to the axes. On these lines lay off these distances 4'–1' and 3'–2'. Then connect these points and the points *B'* and *D'*.

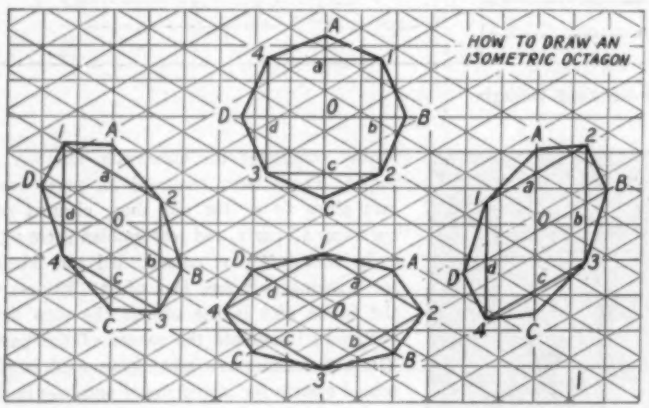


FIG. 1

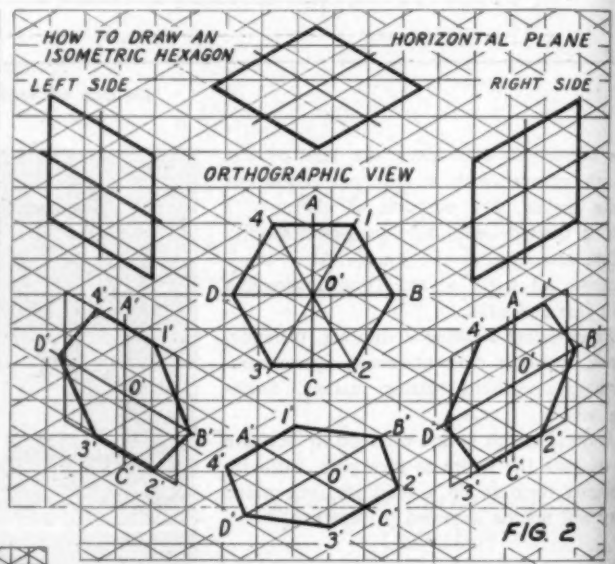


FIG. 2

FIG. 3

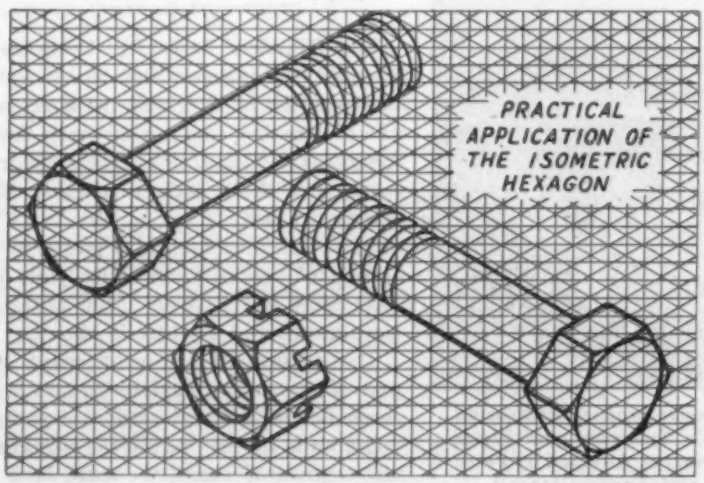
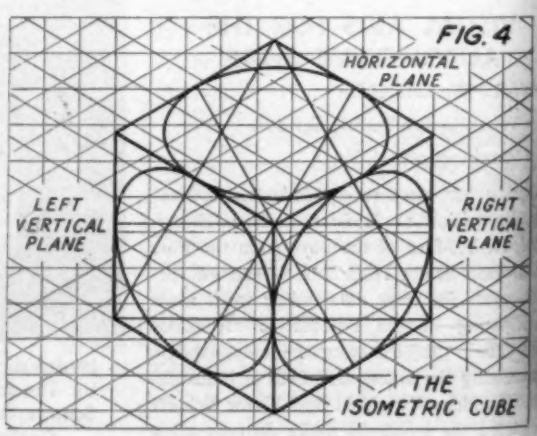
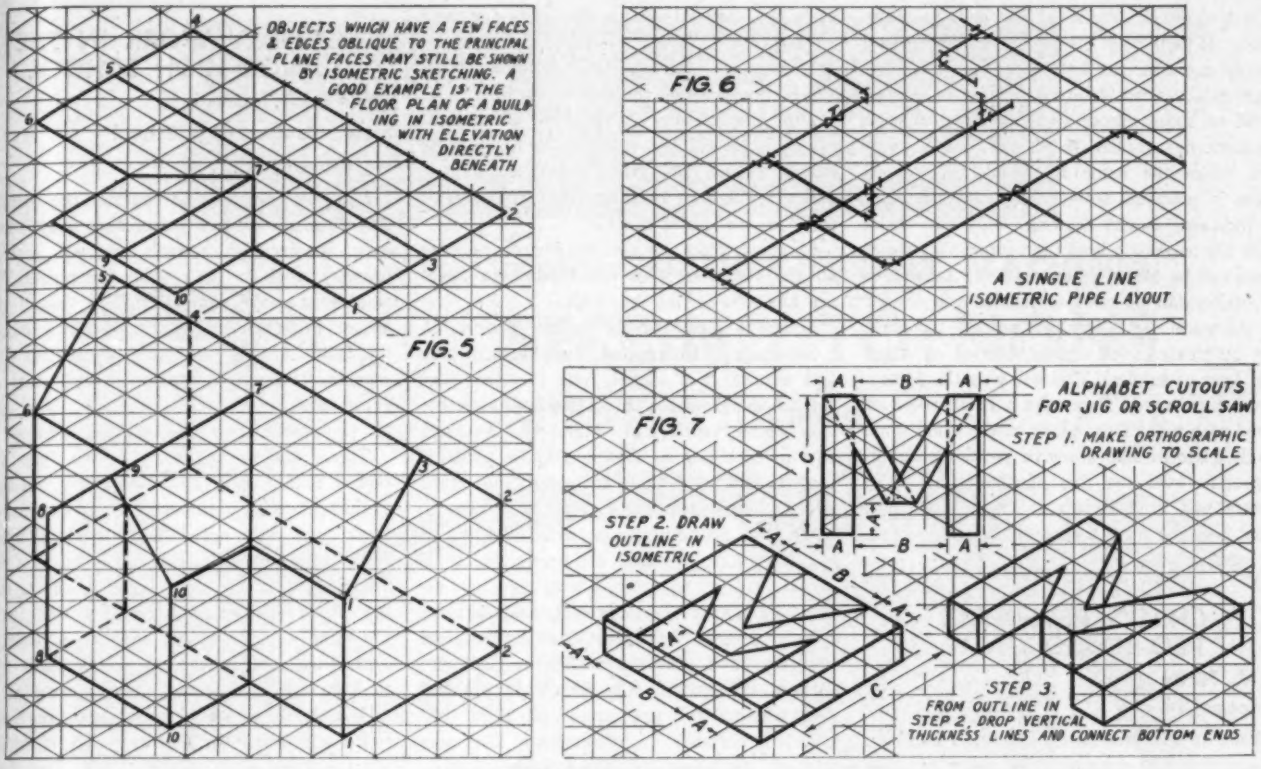


FIG. 4



Isometric drawing


OBJECTS WHICH HAVE A FEW FACES & EDGES OBLIQUE TO THE PRINCIPAL PLANE FACES MAY STILL BE SHOWN BY ISOMETRIC SKETCHING. A GOOD EXAMPLE IS THE FLOOR PLAN OF A BUILDING IN ISOMETRIC WITH ELEVATION DIRECTLY BENEATH
FIG. 5
FIG. 6
A SINGLE LINE ISOMETRIC PIPE LAYOUT
FIG. 7
ALPHABET CUTOUTS FOR JIG OR SCROLL SAW
STEP 1. MAKE ORTHOGRAPHIC DRAWING TO SCALE
STEP 2. DRAW OUTLINE IN ISOMETRIC
STEP 3. FROM OUTLINE IN STEP 2, DROP VERTICAL THICKNESS LINES AND CONNECT BOTTOM ENDS

Isometric adaptations

All the distances are taken from the orthographic view with dividers.

COPPER NAME PLATES

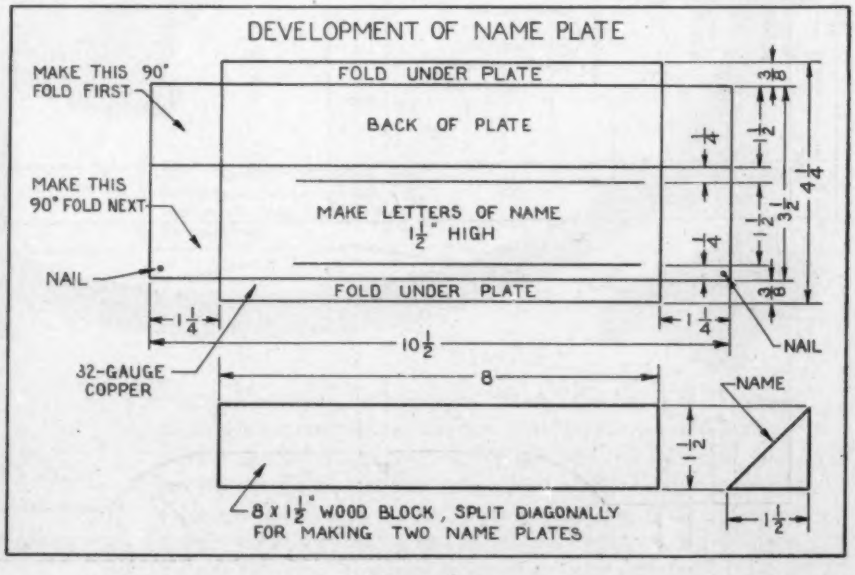
DAVID C. FISCHER
Fort Totten, N. Dak.

Name plates made out of 32-ga. sheet copper and a block of wood can be easily assembled in about an hour's time. This means that the plates lend themselves to be produced by the mass production method. The plates have a unique appearance and can serve a good purpose around shops, offices, military camps, and schools. They also make excellent gifts for almost any occasion. The lettering may be made in any style, or the individual can work in his signature. One is done as easily as the other.

Method of Construction

Note size of letters from drawing. Letter the name, or the person for whom the name plate is made can write his name on a sheet of paper approximately 1½ in. in height. This sheet of paper is reversed and traced on the copper in the space indicated in the drawing. A ball-point modeling tool is then used to trace and tool the name into the copper sheet. If no modeling tool is available one can be made from a piece of wood the size

Copper name plate



Name plate

of a lead pencil; round off the ends to make a sort of ball point. With the modeling tool simply run over the letters or signature until there is a desired indention. Place the copper sheet on some rubber from an inner tube or on some newspapers during the tooling process. When the name is tooled, the copper sheet is wrapped around the block of wood as indicated in the drawing. Only two small nails are needed to hold the copper. Of course, more can be driven as one sees fit. A hammer or mallet can be used to fashion the copper to the wood. As a finishing process the plate can be treated with a mild solution of water and liver of sulphur. This will give the plate a dark appearance. Then take a small piece of wood with a flat face; place on the wood some tooth paste or fine abrasive powder and rub the stick over the tips of the letters. The letters will brighten up and will stand out. Next give the plate a coat of shellac, varnish, or lacquer.

CHILD'S REVERSIBLE PEG-BOARD GAME

I. M. FENN
Chicago, Ill.

Here is a simple game for small children. Instructors will certainly find many students in their classes who will not have to be asked twice to make this project which offers many valuable experiences. Many students will welcome the chance to make this game for their little brothers, sisters, cousins, or other children they are fond of. Very little motivation will be necessary on the part of the instructor.

Directions: Study the drawing and bill of material. Obtain the wood necessary for the parts. Square the two sides and shape according to the drawing. Prepare the two ends in the same manner.

Square a piece for the peg board and bore all the required holes. Also bore the holes for the dowels in the sides.

Square a piece for the center support.

Sandpaper all parts and assemble with glue and screws. Use dowel rods for the pegs and wooden hammer. After sanding, assemble the hammer with glue. Make two backsaw cuts in each peg so that it may be pounded through the peg hole with not too much effort. Finish the peg game in colors to make it as attractive as possible.

Experiences: Reading a drawing, planning, layout, sawing, squaring, boring, sanding, assembling, gluing, using screws, finishing, etc.

This project will give good training in accuracy, and students will soon find out, without the help of the instructor's critical eye, whether the peg game has been constructed accurately, by coaxing the pegs through the holes with the wooden hammer. Instructors will find that it is natural for the students to test this particular project before it leaves the shop.

FOUNDRY WORK IN THE JUNIOR HIGH SCHOOL

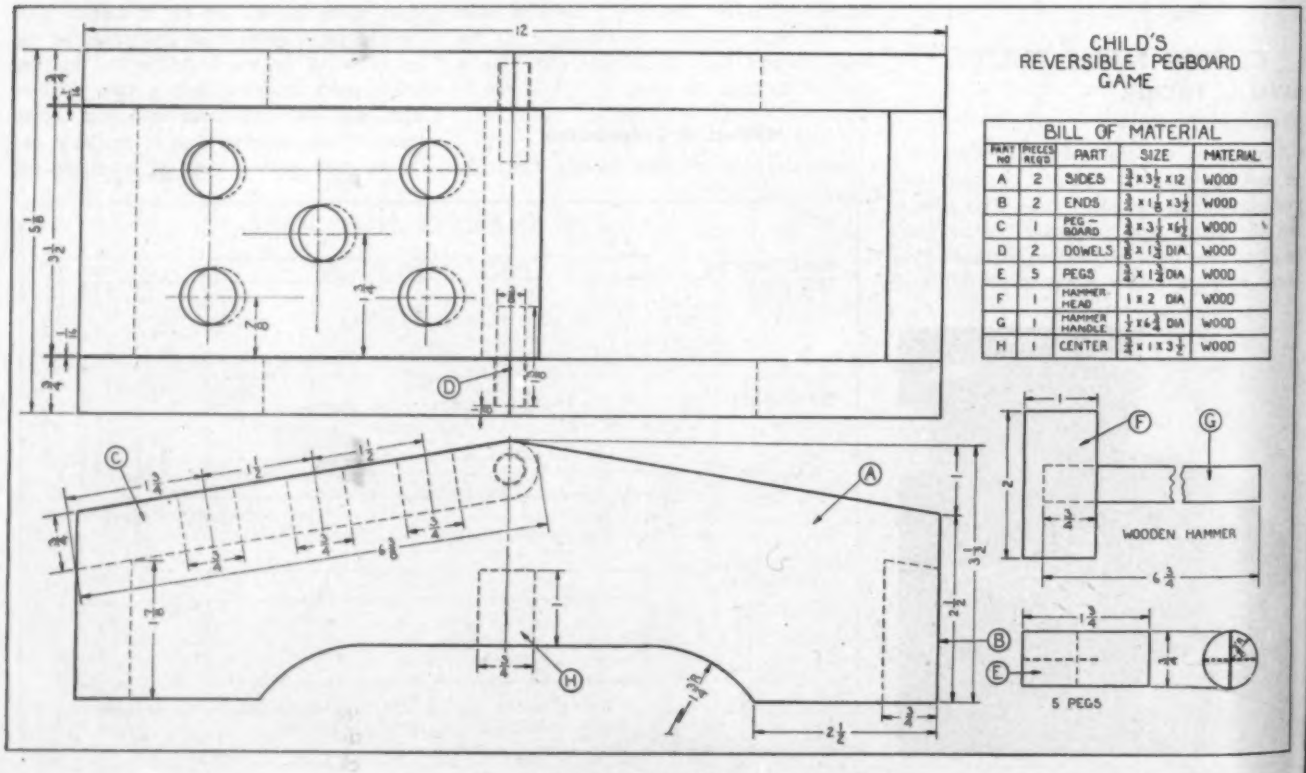
MERVYN T. JONES
Stewart Junior High School
Norristown, Pa.

Did you ever stop to consider the reasons why so many modern junior high schools and even senior high schools do not include foundry work in their shop programs? The making of molds and castings is one of the largest branches of the metalworking industry, and still it is often ignored in our schools. The reasons given for this state of affairs are usually: lack of space, high cost of equipment, and the danger involved.

These reasons might well have been accepted many years ago, but today, modern equipment has outmoded these excuses. I think you will agree that teachers often figure some things are not needed in their school shop when they begin teaching, and ten or twenty years later they still think the same way. The alert and active teachers change their ideas to meet school needs and to keep up to date with new equipment.

A unit in foundry work takes up little space and an entire foundry unit could be purchased for approximately $300. This price can easily be reduced by making many of the articles in your own shop. For this small

(Continued on page 18A)


CHILD'S
REVERSIBLE PEGBOARD
GAME
BILL OF MATERIAL
PART NO | PIECES REQ'D | PART | SIZE | MATERIAL
A | 2 | SIDES | 3/4 x 3 1/2 x 12 | WOOD
B | 2 | ENDS | 3/4 x 1 5/8 x 3 1/2 | WOOD
C | 1 | PEG-BOARD | 3/4 x 3 1/2 x 6 1/2 | WOOD
D | 2 | DOWELS | 5/8 x 1 1/2 DIA | WOOD
E | 5 | PEGS | 3/4 x 1 1/2 DIA | WOOD
F | 1 | HAMMER HEAD | 1 x 2 DIA | WOOD
G | 1 | HAMMER HANDLE | 1/2 x 6 3/4 DIA | WOOD
H | 1 | CENTER | 3/4 x 1 x 3 1/2 | WOOD
WOODEN HAMMER
5 PEGS

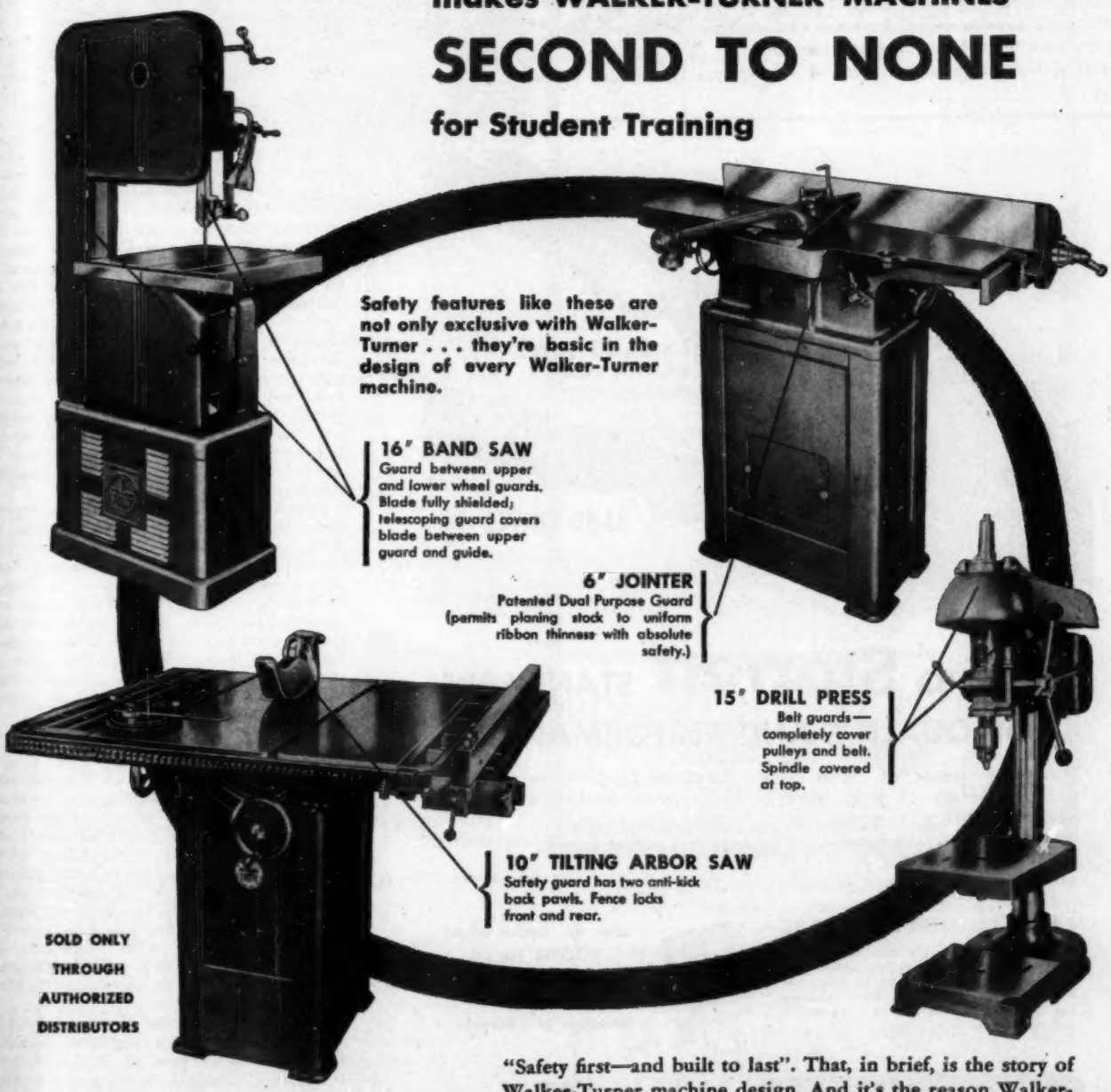
Details of pegboard

Safety First

makes WALKER-TURNER MACHINES

SECOND TO NONE

for Student Training



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(Continued from page 414)

cost, you would take care of three or four boys every period of the day.

In the general metal shop where I teach, there are many thrills that I enjoy when watching a boy complete a worth-while project. But the greatest satisfaction I ever witnessed was a boy waiting to see the results of a pouring he has just finished. His eyes light up, and the entire shop class is "anticipating" the results.

When you have to coax a boy away from foundry work to get him into some other unit of work and when you see him spending time in preparing a mold for pouring, then you will realize that in foundry work you have an activity which will meet all the objectives of a good industrial-arts program.

DEVELOPMENT OF VOCATIONAL EDUCATION

A Book Review

By Layton S. Hawkins, Charles Allen Prosser, and John Calvin Wright. Published by The American Technical Society, 848 East 58th Street, Chicago 37, Ill. 1951. Cloth, 5⅞ by 8½ in., 656 pp. Price $7.50.

The development of vocational education in the United States, characterized in the Preface to this book as "a major contribution to the concept of democracy the world over," had its inception in the work of the first Commission on Industrial Education appointed by William L. Douglas, governor of Massachusetts, the report of which was published in June, 1906. From this beginning, in less than 50 years, the movement progressed to the point at which for the fiscal year ended June 30, 1949, the sums appropriated by the federal government for distribution among the several states and territories, under the provisions of the Smith-Hughes and George-Barden Acts, amounted to $27,127,882. This total was more than doubled by the matching appropriations and the amounts spent by the states and cities in accepting the provisions of these laws.

Free Public Vocational Education

This history was undertaken for the purpose of recording the progress of the struggle to develop, through science, discovery, and invention, a dynamic, instead of a static, civilization, and to develop also a dynamic system of free public vocational education to support and promote that civilization. The successive steps in the evolution from the static society of primitive peoples to the dynamic society of modern civilization are summarized in the following factors of progress: "individual ingenuity and initiative, unconscious absorption and imitation, conscious imitation in the home, unorganized training in the home, organized training in the home, division between home and occupation, conscious and organized training through apprenticeship, pickup learning of specialized tasks, and organized training through such devices as apprenticeship, the foreman instructor, and the public and private vocational school."

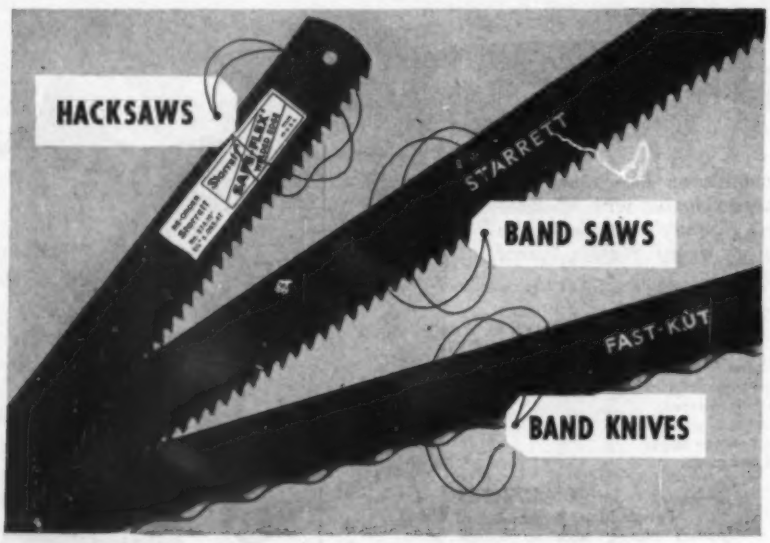
Following a brief statement concerning the historic background of vocational education, the book discusses the significance of the early sporadic attempts to solve some of these problems through evening schools and classes; the Mechanics Institute movement; and the experiments with manual-labor schools. Next came the first state system of free industrial schools, in Massachusetts, followed by similar action in other states, including the appointment of commissions to study and make recommendations, and the resulting legislation in five states by 1911.

Significant Steps

Subsequent developments are discussed fully, in order to set forth the significance of the organization of the National Society for the Promotion of Industrial Education, in November, 1906; the appointment by President Wilson of the Commission on National Aid to Vocational Education, in January, 1914; the enactment of the Smith-Hughes Law and the initial organization of the Federal Board for Vocational Education, in 1917; the transfer of the functions of the Federal Board to the U. S. Office of Education, on June 10, 1933, and the abolition of the board, on May 16, 1946.

The last two operations were accomplished by executive orders under permissive legislation enacted by the Congress, the first by President Franklin D. Roosevelt, and the second by President Harry S. Truman. Characterizing these orders as "steps backward in educational progress," the authors make a vigorous defense of the traditional American ideal of public education administered by boards of education made up largely of nonprofessional members. "It would have been much more consistent with our whole philosophy

(Continued on page 21A)



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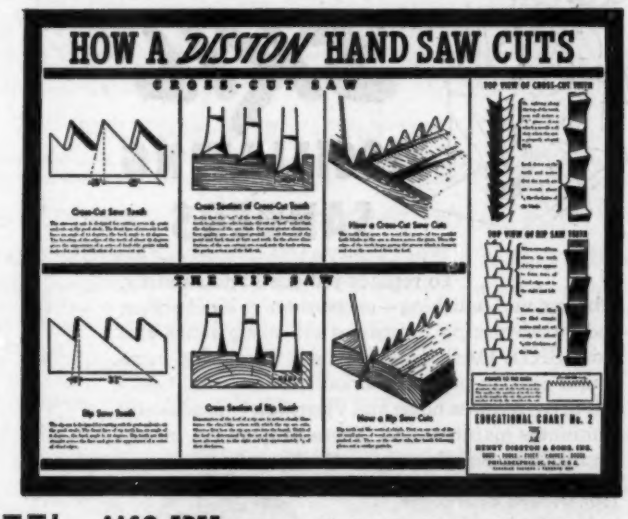

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DEVELOPMENT OF VOCATIONAL EDUCATION

(Continued from page 18A)

of educational administration to have created a Federal Board of Education into which the functions of both general and vocational education could have been merged." It is argued that the problems of vocational education concern directly all the many classes and kinds of people engaged in the hundreds of occupations by which people earn a living and for which preparation is needed. It is pointed out that it is impossible for any administrator in Washington, or in any state capital, to understand the requirements of such a variety of situations, to comprehend the multiplicity of problems that arise, or to undertake to make the innumerable decisions that must be made.

The success of the program of vocational education calls for the special knowledge and advice of men and women "who truly know and represent the interests of each group," and who can discuss intelligently the varied needs. This specific and vital service had been supplied by the composition of the Federal Board for Vocational Education, and by the state and community advisory boards provided for in the legislation.

Principles and Policies

A prominent feature of the book is the treatment of the evolution of statements of principles and policies for the administration of vocational education, beginning with those enunciated by the National Society for the Promotion of Industrial Education, the Commission on National Aid to Vocational Education, and the Federal Board. These passages are of special interest to the student concerned with the foundations upon which the movement has been built.

Other chapters of vital importance include those dealing with state plans for vocational education, problems of preparation of teachers and directors, state and community supervision, occupational information and guidance, research, legal opinions, and court decisions. Separate chapters deal with the contribution made by vocational education to World War I, World War II, the rehabilitation of disabled soldiers, sailors, and marines, and the rehabilitation of disabled civilians.

The book closes with an Appendix of 100 pages, including a summary of the report of the Commission on National Aid to Vocational Education, which is invaluable because the original report is now out of print; a special study of apprenticeship; reproduction of the program of the first formal meeting of the National Society for the Promotion of Industrial Education, which was held in Chicago, on January 23–25, 1908; report of the "Committee of Ten" on the relation of industrial training to the general system of education, Atlanta, November 21, 1908; text of the Smith-Hughes Vocational Education Act, approved by President Wilson on February 23, 1917, also summaries of succeeding and supplementary laws relating to vocational education; summary of the educational section of the "G.I. Bill of Rights," Servicemen's Readjustment Act of 1944; seven pages of tables giving details of appropriations in aid of vocational education; and finally an index of 12 pages.

The Authors

With reference to the authors of this book, it may be said that it would have been impossible

(Continued on next page)

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our school board purchased the
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12" x 4" PLANER
...it is THE MOST USEFUL MACHINE IN THE SHOP!"

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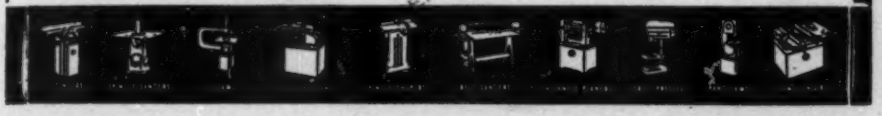

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DEVELOPMENT OF VOCATIONAL EDUCATION

(Continued from previous page)

to select three men better informed or better qualified to write an authoritative and convincing account of the development of vocational education in the United States. Reducing the statement of their qualifications to the briefest summary, they may be described as follows:

Charles Allen Prosser was the first deputy commissioner for vocational education in Massachusetts, executive secretary of the National Society for the Promotion of Industrial Education, member of the Commission on National Aid to Vocational Education, first director of the Federal Board for Vocational Education, director of Dunwoody Institute in Minneapolis, and for more than 35 years the outstanding leader of the vocational education movement.

John Calvin Wright was a member of the original staff of the Federal Board for Vocational Education, and from 1922 until his retirement in 1946, he served as director, and later as assistant commissioner for vocational education.

Layton S. Hawkins was a member of the vocational education staff of the State Department of Education, Albany, N. Y., including one year as state director; a member of the original staff of the Federal Board for Vocational Education, he later served as director of education in several important industrial corporations, returning to Washington as chief of trade and industrial service.

In these varied capacities the three men played significant roles not only in the original formulation of principles and policies, and in the framing of federal and state legislation, but also in the organization and administrative direction of the program itself.

This is the most important book dealing with the development and progress of vocational education, and especially with the evolution of administrative principles and policies, since the publication, in 1926 and 1937, of the two-volume *History of Manual and Industrial Education* by the late Charles A. Bennett. This book supplements the monumental work by Bennett, bringing the narrative down to date, but it does much more by its discussion of administrative problems, legislative trends, and the details of the activities of official boards, commissions, and state agencies. The entire movement is under deep obligation to the authors and publishers, and the book will be permanently indispensable to educators, administrators, legislators, and laymen having responsibility for any phase of vocational education, and to all students of the subject.

WILLIAM T. BAWDEN, *Emeritus Professor, Kansas State Teachers College, Pittsburg, Kans.*

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ASSOCIATION NEWS

(Continued from page 6A)

toastmaster. Mr. Luehring presented the guest speaker for the evening, Dr. Fred Swalls, who spoke on the subject, "What a School Administrator Expects of an Industrial-Arts Teacher."

GRADUATE MEN'S CLUB DINNER

The Stout Institute Graduate Men's Club held a recognition dinner on July 26, 1951, at 6:15 p.m., for the candidates for the master's degree who spent the 1951 summer session at the institute.

After the dinner short addresses were made by Dr. Verne C. Fryklund, president, and by Dean Clyde A. Bowman, director, summer session, and dean, division of industrial education.

Then followed the "Recognition of Graduates" by Ray A. Wigen, director, graduate studies.

The main address was given by R. P. Moser, superintendent of schools, Columbus, Wis., who spoke on "What a City Superintendent Sees in Practical Arts."

Martin Burkhardt acted as toastmaster.

The officers of the Graduate Men's Club for 1951 are: Malcolm McIntyre, president; Willis Rockwell, vice-president; and Robert Nerbun, secretary-treasurer.

CLEVELAND CONFERENCE ON GRAPHIC ARTS EDUCATION

The 26th annual conference on Graphic Arts Education was held at the Hotel Statler, Cleveland, Ohio, on June 17 to 20, 1951.

The theme of the Monday morning meeting was "What's Ahead in Graphic Arts Education—Emergency Training for Defense." Milford Hamline presided. The speakers were John E. Fintz, Walter J. Bishop, George Wise, and Dr. L. H. Dennis.

The panel discussion, which followed the foregoing addresses, was conducted by Loren H. Carter.

Byron G. Culver was chairman at the afternoon

(Continued on page 24A)

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ASSOCIATION NEWS

(Continued from page 22A)

meeting, the theme of which was "Looking Ahead in Defense Training for the Graphic Arts."

The speakers were Samuel Burt, Charles Shapiro, M. J. Horsch, Miss Mildred Hickman, and Dr. Edward C. Estabrooke.

The Printing Industry of Cleveland, Inc., and the Cleveland Club of Printing House Craftsmen, sponsored a "Graphic Arts Night" on Monday evening.

The Tuesday morning meeting was conducted by Edward Parker, Toronto, Que., Can. The speakers were William R. Mason and Ferdy J. Tagle.

Tuesday afternoon was devoted to a visit to the Harris-Seybold Co., manufacturers of offset letter presses and paper cutters.

At the banquet on Tuesday evening, Frank C. Moore was toastmaster. Speakers on this occasion were George Welp, Robert H. Caffee, and Dr. Mark C. Schinnerer.

The IPI contest awards also were distributed on this occasion.

The Wednesday morning meeting was devoted to a series of demonstrations in bookbinding, paper making, and silk-screen printing.

At the business meeting George J. Bilsey and the other officers of the 1950–51 regime were re-elected for the year 1951–52.

♦ The program of the Midwestern Ohio Industrial Arts Association for the school year 1951–52 will consist of six meetings. They are to be held in various sections of Northwestern Ohio on the third Wednesday of October, November, January, February, March, and April.

First program: October 17 — Organization Night — Fostoria, Ohio
Second program: November 21 — Factory Visitation — Bryan
Third program: January 16 — Administrator's Night — Bowling Green (tentative)
Fourth program: February 20 — Demonstration Night (featuring instructional aids) — Open
Fifth program: March 19 — Project Night — Open
Sixth program: April 16 — Ladies Night — Port Clinton (fish dinner)

— Harry R. Adams, Publicity Chairman

♦ The newly elected Ship officers for 1951–52 are:

Clyde C. Clack, Captain, Binney & Smith Co., 6200 St. Andrew Drive, Dallas 5, Tex.

Todd Jones, First Mate, School Shop Magazine, 330 S. State St., Ann Arbor, Mich.

John Guthrie, Second Mate, Weber Costello Co., Chicago Heights, Ill.

R. C. Stucker, Log Officer, Brodhead-Garrett Co., 4560 E. 71 St., Cleveland, Ohio.

William B. Jennison, Purser, School Arts Magazine, 44 Portland St., Worcester 8, Mass.

Harry E. Masters, Radio Officer, L. S. Starrett Co., Athol, Mass.

Dave McCurrach, Steward, Eberhard Faber Pencil Co., 37 Greenpoint Ave., Brooklyn, N. Y.

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Judge it from any angle: for accuracy, stamina, rigidity or capacity (for size). Check its component parts—its spindle, spindle bearings, lead screw, apron, carriage, bed, gearing, or the power delivered by its drive—you will find the SHELDON Lathe a quality tool both in appearance and "under the hood".

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Personal News

PROMINENT INTERNATIONAL VOCATIONAL EDUCATOR CLOSES HIS CAREER

George S. Sanders, 60, active vocational educator for more than 35 years as a teacher, supervisor, state director, special representative for the U. S. Office of Education, the Institute of Inter-American Affairs, and the War Department, and one of the nation's great leaders in the field of vocational education, died July 28, 1951, at his home in Santa Monica, Calif.

He had returned recently from his latest international assignment from the War Department at Okinawa where he surveyed college and public school vocational facilities in the Ryukyus Islands. He was stricken while at the islands, but returned and completed his survey and reports of recommendations just a month before his death.

He was born January 15, 1891, in Salt Lake City, Utah, and was educated in the schools of that city and graduated from the L.D.S. University. He continued his advanced education in various eastern schools and was awarded his masters degree at the Colorado A. and M. College, Fort Collins, Colo.

He started one of the first day trade courses in the State of Utah under the Smith-Hughes program. From his position as an electrical instructor with the Ogden City Schools, he advanced to the position of state director of trade and industrial education for the state of Utah.

(Continued on page 27A)

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...the ideal all-purpose machine for vocational schools

Hundreds of schools today are using DeWalt in their vocational training. This world-famous radial power saw enables students to learn *now* for *tomorrow!*

DeWalt is fast—accurate—safe. It's the basic woodworking machine for doing everything in woodworking. It also cuts plastics and light metals.

This *basic woodworking machine* includes: Pressed Steel Table Frame, Table Top Assembly on Steel Leveling Cleats, Machine Column and Base and Cantilever Arm, Grease Shielded Ball Bearing Carriage with frictionless Swivel Yoke Assembly, Direct Drive Motor with Grease Sealed Ball Bearings, Formex-Fiberglass Insulation, Overload Protective Cut-Out Switch, Special School Safety Saw Guard with Anti-Kickback Device and Set of Wrenches.

DeWalt is compact—takes up little floor space. Investigate the full merits of this all-purpose machine. It is available in models ranging from ½ H.P. to 7½ H.P. Write for complete information. Address: Dept. 1A-12, Fountain Avenue, Lancaster, Pa.

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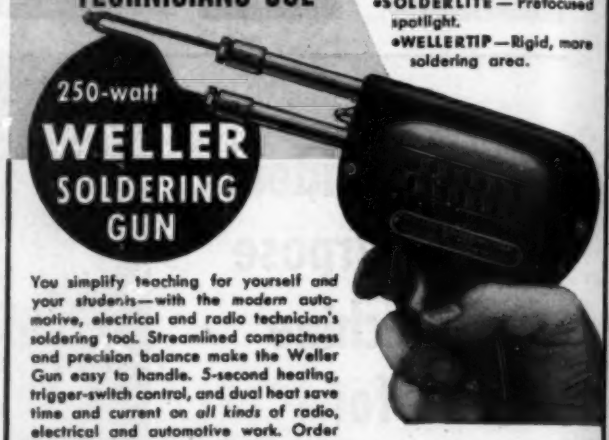

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Trains Your Students Better -- DOUBLES Life of Your Saws

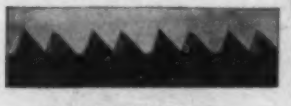
"ONE OF THE BEST MACHINES WE HAVE FOR TRAINING PURPOSES" — Samuel Gompers Trades School, San Francisco

The Foley is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner — stay sharp longer.

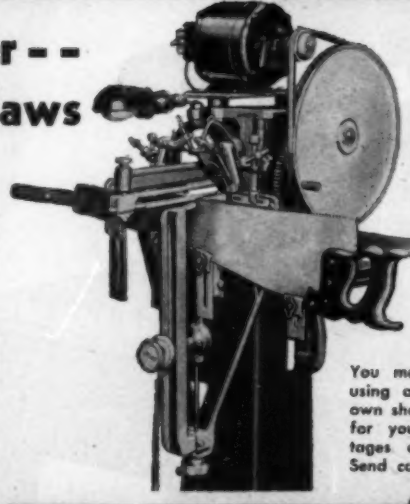
With a Foley Automatic Saw Filer you can sharpen your saws more perfectly than is possible by hand. You can do it quicker, — and your saws will stay sharp longer. Your students will turn out better work with sharp saws. ALSO by keeping your saws sharp with a Foley, — you will easily double their cutting life and have less breakage, reducing replacements to a minimum.

Train your students to file saws on a Foley, for they will find thousands of Foley Saw Filers used in industry, Army, Navy, Air Corps, etc. Hundreds of schools and colleges use them to save on saw filing costs and replacement expense.

The* FOLEY SAW FILER *Makes . . .



on OLD SAW . . . . . LIKE NEW!



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30-DAY TRIAL OFFER

You may have the privilege of using a Foley Saw Filer in your own shop for 30 days, — and see for yourself its training advantages and operating economies. Send coupon for details.

Send in this Coupon

FOLEY MFG. CO., 3318 N.E. 5th Street Minneapolis 18, Minn.
Please send literature on the Foley Automatic Saw Filer and details of your 30-Day Trial.

Name.....

Address.....

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PERSONAL NEWS

(Continued from page 24A)

From that position he went to the state of Maryland where he carried on industrial-training services for industry in that state and also assisted the Maryland state department of education. Following that assignment he assumed the leadership in Arizona as state director of vocational education. He held a reserve commission in the Navy

George S. Sanders

from 1926 to 1940, when he was called in to the Office of Education, Washington, D. C., and given the assignment for the development of the Air Corps training program to meet the national emergency. He was made assistant chief for all U. S. Army Air Corps Depot training for the War Manpower Commission with headquarters at Wright Field where he spent the next six years. Under his jurisdiction the mechanic-learner program for the Air Corps Air Service Command was developed. Training materials were produced which made the training of thousands of new workers available for the war effort. The smooth and effective operation of the Air Corps Depot programs and co-operative school relationships were a direct result of his enthusiastic leadership.

As the War Manpower Commission came to a close, the Institute of Inter-American Affairs, Education Division at Washington, D. C., enlisted his services to assist them in the development of their programs in Latin America. As director of programs he visited the Central American republics, Panama, Equador, Peru, Chile, Argentina, Uruguay, Brazil, Bolivia, and Paraguay to survey the training needs and facilities for trade and industrial-education co-operative programs with the United States. He was subsequently assigned to Brazil where he assisted in the establishment of the joint Brazilian-American Commission for Trade and Industrial education. This commission has assisted greatly in the development of co-operative relationships between the two governments. Under this program a definite plan of exchange teachers was developed and several groups of educators were sent to the trades schools in the large cities of the United States for training. Educational specialists were also sent to Brazil to assist in giving leadership training.

From Brazil he went to Paraguay to conduct a vocational education survey. His findings and recommendations for the institute will be used as a guide for future action in the co-operative

(Continued on next page)

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- For wood working, spot welding, metal sawing, buffing, etc.
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WILLSON eye and respiratory safety devices are distributed to schools by

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CLEVELAND, OHIO

See their Catalog (page 182) for further information

WILLSON PRODUCTS, INC., 216 Washington St., Reading, Pa.

PERSONAL NEWS

(Continued from previous page)

development of trade and industrial and industrial-arts education. His next assignment carried him to Panama. Here he directed a survey of vocational facilities and taught in the 1950 summer session at Teachers College in Panama.

In April of this year he was called by the War Department to go to Okinawa to survey the college vocational facilities in the Ryukyus Islands and recommend a plan for the development of a sound vocational program in that area of the Pacific.

He was a member of the American Vocational Association and helped to promote the expansion of its services at home, and beyond the seas. He helped also to develop the Latin-American panel sessions at the AVA conventions and was anxious to see the great vocational movement grow and to assist his fellow men everywhere in helping them to find their place in this industrial world.

He is survived by his wife and two daughters. He will be remembered as a kind, sympathetic leader, optimistic, unselfish and considerate, liberal and tactful. — *LeRoy A. Blaser, Oakland, Calif.*

CLARENCE E. RAKESTRAW DIES

Clarence E. Rakestraw, who was the T. and I. agent for the central region and later for the southern region from 1927–40, died at Doctor's Hospital, Washington, D. C., after a two-day illness.

In 1940, he was appointed consultant in Employee-Employer Relations, a position which he held until his death.

He also was widely known as a conference leader.

♦ JOHN BELL, who received his B.S. and M.S. degrees from Kansas State Teachers College, assumed the duties of director of industrial education in Des Moines, Iowa, on July 1, upon the retirement of Mr. Woolman.

Mr. Bell came to DesMoines after teaching four years in Kansas. This past year was his thirteenth in Des Moines. He served as lieutenant in the Navy, Pacific area, after Pearl Harbor.

JERRY R. HAWKE DIES

Jerry R. Hawke, executive assistant for vocational education, Office of Education, since 1936, died at his home in Washington, D. C., on August 28, 1951.

He was born at Hazelton, Pa., and later moved to Pittsburgh, Pa. He received his A.B. degree from Carnegie Tech., and the M.Ed. degree from Pennsylvania State College.

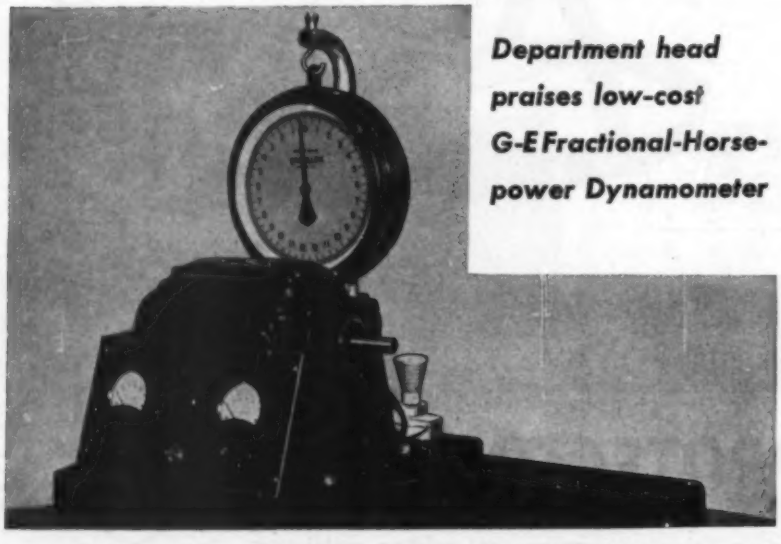
He was director of vocational education at North Braddock, Pa., from 1920 to 1925, and then was appointed to a similar post in Haiti for a period of five years. He also held the position of director of vocational education for Omaha, Neb.

In 1936 he was appointed special agent for trades and industrial education in the Office of Education at Washington, D. C., and also served as regional agent for the western region.

♦ ARNOLD E. LUCE of Minneapolis, Minn., formerly assistant director of the Audio-Visual Education Service of the University of Minnesota, has been appointed audio-visual director for the state of Minnesota.

Mr. Luce succeeds Richard C. Brower, now in visual work with the Foreign Service of the U. S. State Department.

"One of Our Outstanding Pieces of Equipment!"



Department head praises low-cost G-E Fractional-Horsepower Dynamometer

L. J. Sitterlee, Head of Dept. of Electrical Technology, Institute of Applied Arts and Sciences, State University of New York, says: "We feel that the small G-E dynamometer is potentially one of our outstanding pieces of equipment. We are able to demonstrate principles that are usually done on machines costing much more. It is small, compact, and versatile.

"By using a variety of motor mounts we are able to test quickly, and accurately, any type fractional-horsepower motor. Since the instruments and load are mounted on the dynamometer frame, the auxiliary equipment is reduced to a minimum. The self-contained dynamometers are ideally suited for small motor repair shops as well as laboratories."

Use the G-E fractional-horsepower dynamometer to:

- **Analyze motor and generator characteristics**
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For further information on this versatile, packaged, low-cost unit, contact your nearby G-E representative today, or write for Bulletin GEC-635A. *General Electric Co., Schenectady, N. Y.*

GENERAL ELECTRIC

687-68

News Notes

♦ A new edition of "Machine Tools Today," a 24-page machine tool primer published by the National Machine Tool Builders' Association, 10525 Carnegie Ave., Cleveland 6, Ohio, is now available in limited quantities upon request.

The booklet tells what machine tools are and what they do, describes basic methods of cutting and forming metal, and gives general facts about the industry, its nature, location, markets, etc. It also defines the part played by machine tools in peacetime civilization and in national defense.

The booklet is nontechnical and is designed chiefly for teachers and others interested in introducing the subject of machine tools to people unfamiliar with their nature and function.

♦ A revised 24-page Teaching Aids' Catalogue for 1951–52, describing over 85 free and inexpensive booklets, charts, posters, and other audio-visual materials currently available to junior and senior high school teachers, is available from the School Service Department of the Westinghouse Electric Corporation.

These teaching aids cover a wide range of subjects including aids in science, social studies, agriculture, home economics, industrial arts, and photography. The catalogue also has sections on audio-visual aids, lighting the school plant, tech-

(Continued on page 30A)

Multiply your students'

craftsmanship

by teaching

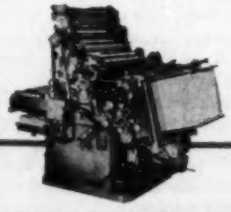
Offset printing

The demand for trained offset pressmen is growing every day.

Although the number of people employed in offset printing jumped 102 per cent during the past eleven years, the supply of skilled workers is still inadequate. By providing offset instruction in this important field of graphic arts education you are filling a real need.

An excellent offset press for student instruction and learning is the ATF Chief 22. It's easy to operate—easy to handle—and is the press now in use in many plants, turning out fine quality work.

If you consider adding a complete offset plant to your training course, ATF will also be glad to talk to you about process cameras and platemaking equipment. AMERICAN TYPE FOUNDERS, Department of Education, 200 Elmora Avenue, Elizabeth B, New Jersey.



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NEWS NOTES

(Continued from page 28A)

nical publications, and Westinghouse scholarships available to students and teachers.

Each catalogue contains order blanks for use in requesting desired materials.

Teachers can obtain copies of Catalogue B-5408 by writing to the *School Service Department, Westinghouse Electric Corp., P. O. Box 1017, Pittsburgh 30, Pa.*

* * *

In the course of a normal life of eight years an automobile consumes 16 times its weight in gasoline.

New Publications

Problems in Mechanical Drawing

By A. S. Levens and A. E. Edstrom. Paper cover, 56 pp., 8½ by 11 in., $1.60. McGraw-Hill Book Co., New York, N. Y.

This workbook is designed as a second two-semester course for students of mechanical drawing. It is based on French and Svensen's *Mechanical Drawing* textbook and the McGraw-Hill drawing films.

The pages consist of a good grade of drawing and tracing paper on which the drawing problems can be worked out.

This workbook in connection with the companion "First Course" will give the student a good preparation for advanced work in mechanical and architectural drawing courses.

How to Make Your Own Furniture

By Henry Lionel Williams. Cloth, 179 pp., 7⅞ by 11 in., illus., $3.95. Simmons-Boardman Publishing Co., 30 Church St., New York, N. Y.

The author of this book presents the home craftsman with numerous suggestions on how to make, adapt designs for, and finish furniture for the home.

The book presents numerous pieces of movable and built-in furniture.

How to Build Games and Toys

By B. W. Pelton. Cloth, 264 pp., 5¾ by 8⅝ in., illus., $3.95. D. Van Nostrand Co. Inc., New York, N. Y.

An interesting book for young and old workers with tools. The projects described cover a wide field of toys, games, and entertainments, all designed for preschoolers, kindergartners, and middle-aged children.

Most of the projects may be easily constructed and the materials used for making them may be found in almost any home or school shop.

Psychology for Life Adjustment

By Charles R. Foster. Cloth, 456 pp., 5¾ by 8½ in., illus. American Technical Society, Chicago, Ill.

A text on the subject of psychology which presents the student with a comprehensive picture of what he should know about himself and those with whom he meets at school, in his home, and at his place of business; and also how he should adjust his own personality to fit into the complex problems of life with which he finds himself confronted.

Manpower Resources and Utilization

By A. J. Jaffe and Charles D. Stewart. Cloth, 532 pp., 6¼ by 9¼ in., $6.50. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

This book presents first of all a definition of the terms now commonly used, and then studies the labor force, together with the impact exerted upon it by technological, sociological, and economic changes and developments.

It contains many explanatory tables and diagrams.

Keystones of Good Staff Relationships

By Ellsworth Tompkins. Office of Education Miscellany No. 13. 16 pp., 15 cents, 1951. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Where good staff relationships prevail, staff members achieve a high morale, a willingness to work productively, and a sense of values basic to democratic action. Good staff relationships go hand in hand with effective and democratic internal school management.

This pamphlet suggests ways by which large schools can improve their staff relationships. The 12 keystones are based on reported and observed practice in 47 public high schools designated by state and university leaders in education as having good staff relationships.

* * *

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Representation in principal cities
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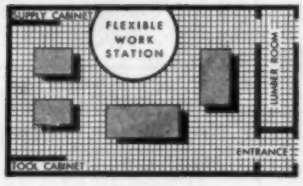
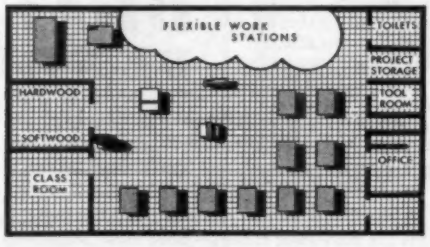
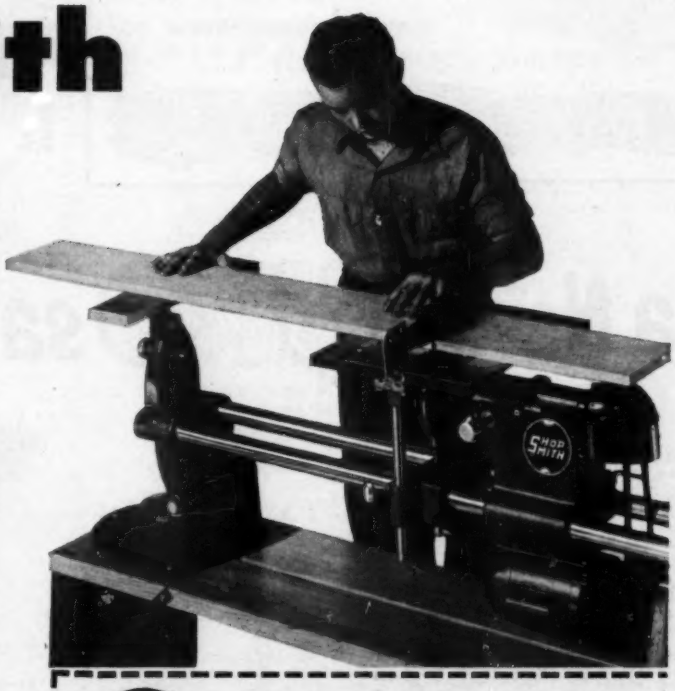
No school's too small  ...or too large  ...for Shopsmith



It's easy enough to see where multi-purpose SHOPSMITH fits into the shop program of smaller schools. One SHOPSMITH takes the place of five individual tools – circular saw, disc sander, wood lathe, vertical and horizontal drill press. It saves space. And it means a better equipped shop on a lower budget.

But what place has SHOPSMITH in large, well-equipped school shops?

You find the answer in SHOPSMITH's *flexibility*. A shop that has several SHOPSMITHS is a *Flexible Shop*. It can be changed to meet the needs of any group of students, any projects, any teaching techniques. In the *Flexible Shop*, machines and students need never stand idle, since the SHOPSMITHS can be converted to relieve congestion or tie-ups. The shop operates at 100% efficiency. Students learn faster. Instruction becomes more effective.

Basic SHOPSMITH costs $189.50 without motor, $232.45 with ½-hp. motor and special school guards. It has been tested and approved by prominent industrial arts educators. Write for specifications of SHOPSMITH and information about the *Flexible Shop*.

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SHOP SMITH

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Dept. 199-U, *at factory nearest you*
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Please send me complete information about the *Flexible Shop* and the application of SHOPSMITH to industrial arts education.

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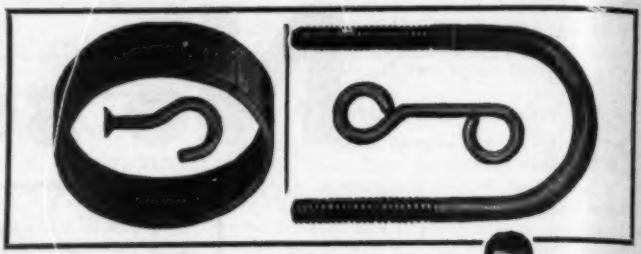

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ideally suited for school shops

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MAXIMUM SAFETY is assured by newly designed rip fence which has a new "T" type safety guide bar . . . new cast blade guard which allows operator to see his work in safety . . . new lock-type switch prevents unauthorized operation of saw.

NEW SAFETY MOTOR MOUNT permits use of odd-size as well as standard motors. In addition, the motor is placed away from the sawdust stream . . . *any* standard open motor may be used.

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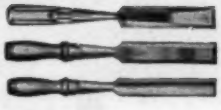

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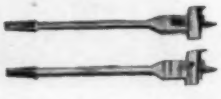

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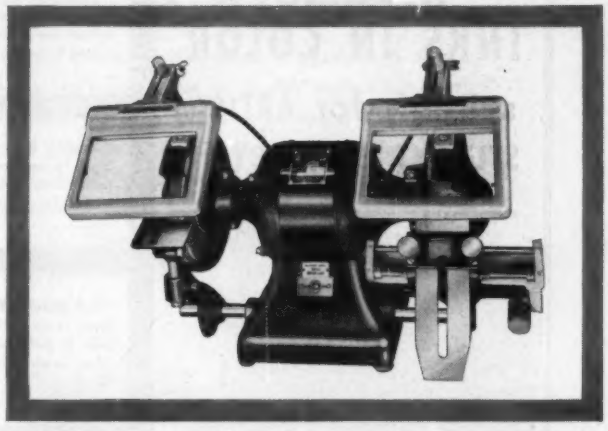

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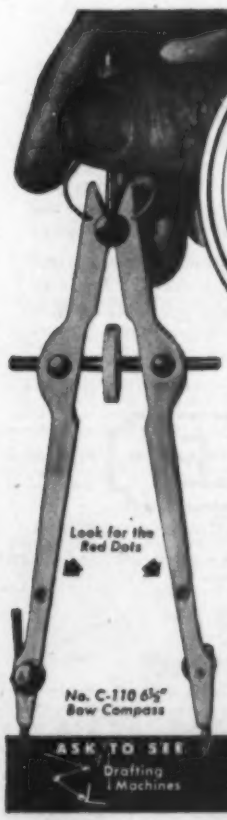

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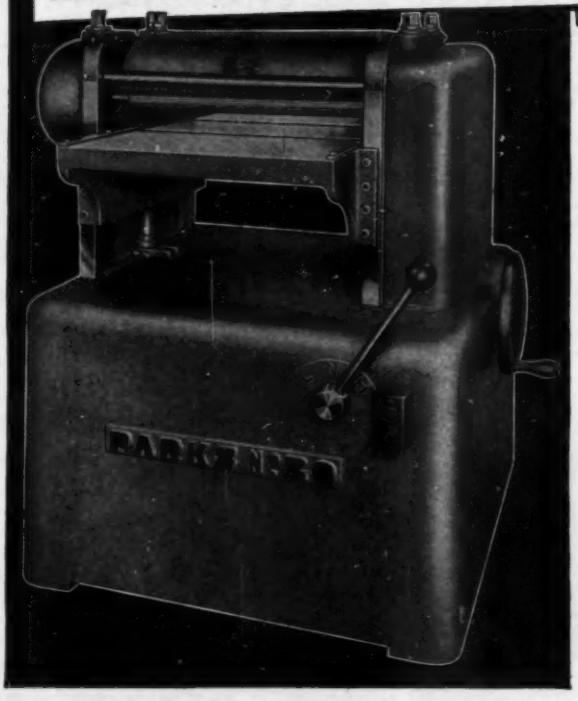

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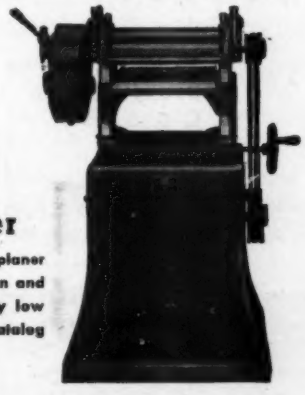

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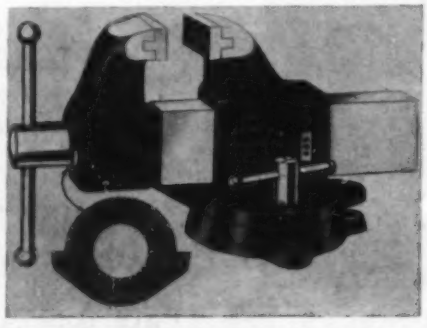
SHOP EQUIPMENT NEWS

COLUMBIAN MALLEABLE IRON MACHINISTS' VISES

An improved line of Columbian malleable iron machinists' vises has just been announced.

An outstanding feature of this vise is a new type graphite-bronze, self-lubricating thrust bearing located at the front of the sliding jaw. This absorbs thrust of the steel screw head, provides easy and positive operation, at the same time preventing wear and eliminating "end play." Because of this bearing, Columbian Vises can be "pulled up tighter and held more securely—with less pressure than is required by ordinary vises."



Malleable iron machinist's vise

Another important and practical feature consists of steel ball handle ends which are forged from the handle stock itself. These cannot come loose.

Columbian Machinists' Vises are made in all standard sizes—3- to 8-in. jaw widths. Their "sledge-tested" malleable iron castings are guaranteed unbreakable. Hardened tool steel jaw faces of "T" section design are pinned into the castings so they cannot come loose in use, but can be easily replaced if chipped or worn.

For descriptive literature and further details, write *The Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland 4, Ohio.*

For brief reference use IAVE—1001.

STARRETT MICROMETER NO. 436 AND A NEW TAPE HOOK

A new micrometer manufactured by The L. S. Starrett Company is designed especially for crankshaft measuring. It has a range from 1½ to 2½ in.

The reading point, the longitudinal line on the sleeve, is on the *underside* of the thimble, *plainly visible while measuring*. Every mechanic will value this feature for measuring between webs, as well as the anvil and spindle lengths which are specially designed for crankshaft measurements.

The frame is finished in smooth black enamel and cleans up easily. Thimble is stamped with convenient decimal equivalents. Rust-resistant no-glare Satin Chrome Finish on sleeve and thimble make markings stand out sharp and clear under any illumination. Spindle has one piece construction with threads hardened, stabilized, and ground from the solid.

Starrett micrometer No. 436

The new Starrett Tape Hook, also made by The L. S. Starrett Company, is designed for ready attachment to any Starrett ¼- or ⅜-in. wide steel tape. When used, it greatly facilitates unassisted measuring of long pipe, casings, steel sheets, lumber, and similar materials. The hook

Starrett tape hook No. 514-C

is made from a brass casting with nickel plated finish and the inner surface of the hook is serrated for a secure grip. It is designed so that the end of the tape is exactly aligned with and takes the measurement from the inside of the hook. It has the added advantage of a handy ring on the hook to provide a convenient finger hold at the end of the tape.

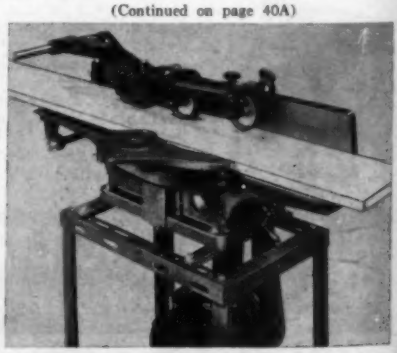
For further information on either of these items write to *The L. S. Starrett Co., Athol, Mass.*

For brief reference use IAVE—1002.

HOLD-DOWN ATTACHMENT FOR JOINTERS

The Duro Metal Products Company of Chicago announces a new jointer safety device, which insures operator safety, and improves the accuracy

(Continued on page 40A)



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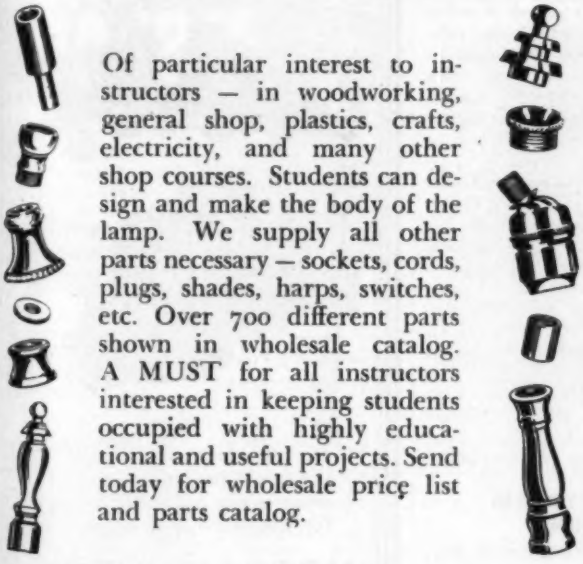

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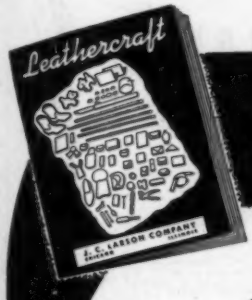

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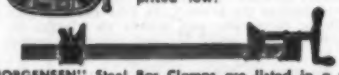

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SHOP EQUIPMENT NEWS

(Continued from page 36A)

and quality of the work and speeds up production.

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For more complete information and prices, write to *Duro Metal Products Co., 2654 N. Kildare Ave., Chicago 39, Ill.*

For brief reference use IAVE—1003.

NEW KEARNEY & TRECKER MILLING MACHINES

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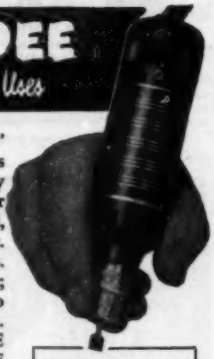

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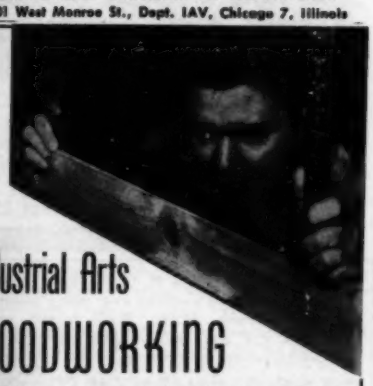

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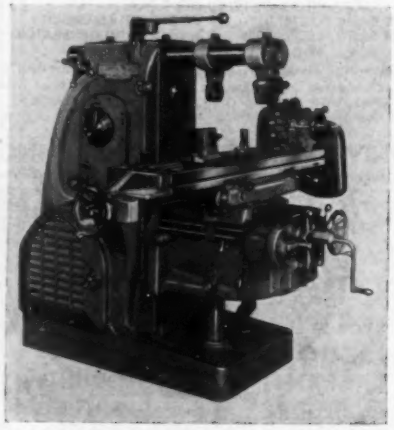

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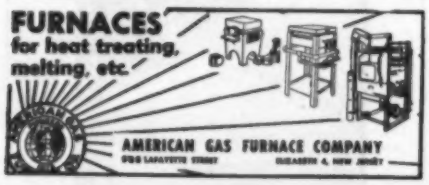

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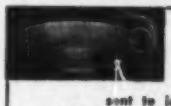

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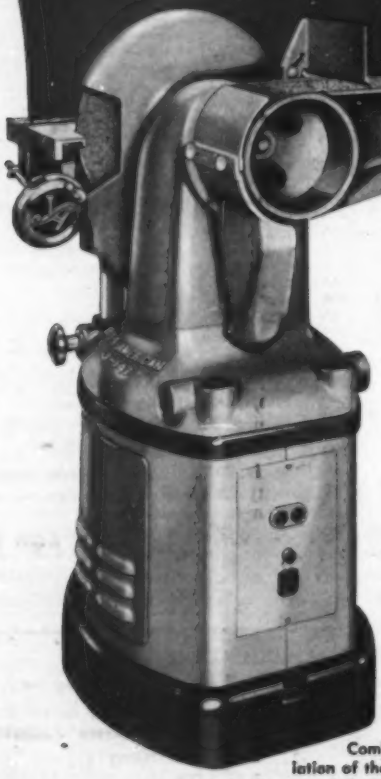

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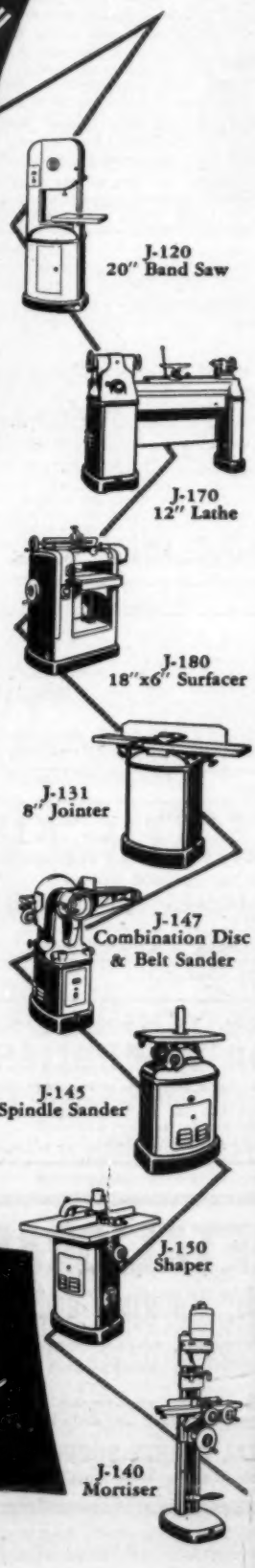

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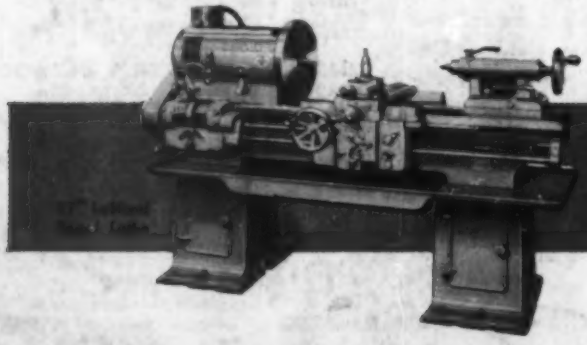

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